LOGIC,

OR

RATIONAL THOUGHTS

ON THE

POWERS

OF THE

HUMAN UNDERSTANDING;

WITH THEIR

USE AND APPLICATION

IN THE

KNOWLEDGE AND SEARCH

OF

TRUTH.

Translated from the GERMAN of

BARON WOLFIUS.

To which is prefixed

A LIFE OF THE AUTHOR.

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PRE-

LIFE

OF

BARON WOLFIUS,

ABSTRACTED

From the German of Professor GOTTSCHED of LEIPSIC.

CHristian Wolf or Wolfius, the son of Christopher Wolf, a creditable tradesman of Breslaw, the capital of Silesia, was born on the 24th of January, in the year 1679. When but very young, he gave indications of an extraordinary capacity, and of a strong propensity to learning. His father, who designed him for the church, omitted nothing, that was thought necessary to qualify him for that service, instilling early into his mind the principles of piety and virtue, and giving him the first instructions in the grounds of

the Latin tongue himſelf; not at ſtated hours, but occaſionally, in the way of familiar diſcourſe and common converſation. In which manner he made an uncommon progreſs. When about eight years old, he was ſent to the Gymnaſium or College at Breſlaw; where, under very excellent maſters, he profited much, not only in grammar, but in the ſciences.

From the divinity-lectures of Dr. Newman of Breſlaw, he firſt came to ſee the imperfections of the ſchool-philoſophy, and to form the deſign of one day improving philoſophy, and rendering it more uſeful.

He neglected not, however, the ſtudy of divinity, not only attending on Dr. Newman's leſſons, but with the greateſt application peruſing the theological ſyſtems of ſeveral Lutheran divines; without omitting thoſe of Calviniſts and Roman-Catholicks, which he alſo read with great care and attention.

Theſe ſtudies, however important, could not divert him from dipping into mathematics. Though he had no opportunity of making any progreſs therein at Breſlaw, as nothing but the uſe of the globes, and drawing geometrical figures, were taught there: yet, by dint of cloſe application, he made himſelf maſter of arithmetic and algebra. He did not ſucceed equally well in geometry; not being able at firſt, to ſee

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the uſe of thoſe ſpeculations. But on attempting to maſter Clavius's tedious demonſtrations, he loſt all patience.

And yet after all, the ardor for learning, ſo deeply rooted in his mind, could not be entirely repreſſed. In the year 1699, Wolfius repaired to the univerſity of Jena, where he ſtudied mathematics and natural philoſophy under profeſſor Hamberger, who read Sturmius's Matheſis Enucleata and Compendiaria, and his Phyſica Conciliatrix, together with Tſchirnhauſen's Medicina Mentis. Sturmius, not keeping cloſe to the rigour of Euclid in demonſtration, gave him but little ſatisfaction.

Beſides mathematics, he there alſo ſtudied philoſophy, and heard all the eminent profeſſors, who read upon it. Nor did he neglect juriſprudence. Puffendorf's book de Jure Naturæ & Gentium, which fell into his hands, he did not much approve, both from its want of good definitions and of ſolid demonſtrations. Sociality, his grand principle of the law of nature, he thought too imperfect a ſtandard, and too ſcanty a bottom for the duties of man. He purſued the ſtudy of divinity with ſuch ardor at the ſame time, that what labour ſoever he beſtowed on the other ſciences, ſeemed to concentre in this.

After a courſe of three years cloſe application, he repaired, about Chriſtmas

1702, to Leipſic, in order to take his degree in philoſophy. Directly upon his examination he returned to Jena, where he continued a year longer, with a view to ſtudy aſtronomy.

About this time, Wolfius carefully read over Tſchirnhauſen's Medicina Mentis; a book not without its obſcurities, ſeeing he never explains what he means by the terms conceivable and inconceivable, nor what, by the elements of real definitions. Wolfius attempted definitions of them himſelf. Conceivable, he explained by notions that mutually infer each other; and inconceivable, by notions which mutually deſtroy each other. The rules for real definitions, he thought, might be eaſily abſtracted from Barrow's Geometrical Lectures, or even from the genetical definition of a circle. The only difficulty remaining was, how to find the elements of real definitions, as Tſchirnhauſen calls them. After ſome reflection on the ſubject, he fell on the two ſpecies of real definitions; viz. the one, à priori, and the other à poſteriori, which he afterwards explained in his Logic.

About Eaſter, 1702, Wolfius waited on Tſchirnhauſen at Leipſic; opened to him his difficulties, and the attempts he had made to form definitions; with which Tſchirnhauſen was very well pleaſed. But as to the elements of real definitions,

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Tſchirnhauſen only ſaid, that was the main thing. Wolfius aſked his advice in the ſtudy of the Calculus Differentialis, a new ſcience, little known at that time: Tſchirnhauſen ſeemed to make no great account of it; ſaid, it depended barely on a propoſition in Barrow's Geometrical Lectures; was far from being the genuine method, only an abſtract from it, there being innumerable methods. Tſchirnhauſen, however, recommended to Wolfius's peruſal, Barrow's Geometrical Lectures, Nieuwentyt's Analyſis Infinitorum, and Elements of Algebra. Upon carefully peruſing thoſe authors, after his return to Jena, Wolfius made a conſiderable progreſs in mathematical knowledge. And, with a view principally to teach mathematics, he repaired, about the end of the year 1703, to Leipſic.

In order to obtain the privilege of reading lectures, Wolfius defended a diſſertation, which he had drawn up at Jena, entitled, De Philoſophia practica univerſali, methodo mathematica conſcripta, with the greateſt applauſe. This was his firſt public attempt, but ſo excellent in its kind, as to be a preſage of what one day he would be capable of performing. He had very early, as we have ſeen, formed the deſign of improving philoſophy, particularly the practical; and for that purpoſe, had applied himſelf to the ſtudy of mathematics, in

order to become maſter of the mathematical method.

Otto Menkenius was ſo well pleaſed with this diſſertation, that he took Wolfius as an aſſiſtant in publiſhing the Acta Eruditorum; ſent a copy of this ſpecimen of Wolfius's abilities to Leibnitz, who greatly commended it, only animadverting on his rejection of formal ſyllogiſm. Leibnitz, who perfectly well knew how to ſeparate the gold from the droſs in the ſchool-philoſophy, ſuggeſted, that he had long ſince diſcovered proofs of the deepeſt penetration and reflection in the buſineſs of ſyllogiſm. Wolfius frankly owns, that he was miſled in this reſpect, by the following ſpecious reaſoning; viz. that the concluſion muſt be previouſly known, before ever a ſyllogiſm can be formed: the fallacy of this, on a cloſer examination, he diſcovered, from conſidering the origin and riſe of ſyllogiſm; from the manner in which, from known premiſes, we may eaſily and naturally draw concluſions: by all which he was led to a diſtinct view of the nature and form of a demonſtration.

As ſoon as he had obtained the privilege of holding public lectures, he immediately ſet about the teaching mathematics: nor did he neglect the other ſciences. He explained natural philoſophy out of Sturmius; and took extraordinary pains in teaching

teaching logic and metaphyſics, in a better way than was uſually done. In metaphyſics, he drew up a ſcheme of his own; ſeeing Leibnitz had not publiſhed any ſyſtem on that ſubject, and that the common metaphyſical books were good for nothing, over-run with cob-web ſubtleties, and unmeaning phraſeology, rather apt to perplex, than to enlighten. And Deſcartes wrote nothing on the ſubject but his *Meditationes*, which was but a very ſhallow performance. In logic, Wolfius explained Tſchirnhauſen's Medicina Mentis. Theſe his explications in metaphyſics, logic, &c. ſupplied him afterwards with the materials for the publication of his German philoſophical works.

Wolfius, what by his leſſons, diſputations, and preaching ſometimes, (in which laſt, his plain and diſtinct manner of delivery was very acceptable to the common people) gained a conſiderable reputation. In the year 1704, he had a call to teach mathematics at Dantzic; in 1705, to Weimar, in quality of rector of the ſchool; and ſome time after, to Gieſſen, to fill the mathematical chair there; whither he repaired in 1706: but the Landgrave of Heſſe-Darmſtadt being then from home, nothing could be done in the affair. On his return thence, he made Halle in his way; where Strykius and Dr. Hofman

ſtrongly perſuaded him to accept of a ſettlement with them. Hofman wrote to Leibnitz, to recommend Wolfius to Baron Dankelman, Curator of the univerſity: which he did, and then Wolfius ſet out for Berlin, in order to wait on the Baron, who, in about a month's time, diſpatched the buſineſs.

Wolfius returned to Halle about the cloſe of the year 1706; where he found things not quite in the ſtate he could have wiſhed. Mathematics were entirely neglected, nay quite unknown, in that place: the mode of philoſophiſing was far from being to his taſte. Beſides, Thomaſius, Gundling and Budiger taught with ſo much applauſe, that he could expect no pupils to his leſſons. For ſome time therefore, he taught mathematics, together with civil and military architecture; all theſe from the treatiſes of others: but algebra, by rules he had drawn up himſelf.

After that, Dr. Hofman, who uſually read lectures in experimental philoſophy, was called to Berlin, in quality of king's phyſician: Wolfius, for the firſt time, began to procure an apparatus of philoſophical inſtruments, and to read lectures both in experimental and dogmatical phyſics: and, at the requeſt of ſome ſtudents, he alſo read on the other parts of philoſophy. His hearers, however, were for ſome time but

few;

few; till a number of ſelect youths, among whom was Kohler, afterwards profeſſor at Jena, poſſibly out of curioſity at firſt, came to attend his leſſons; and finding our profeſſor a man of greater abilities than they expected, they procured a greater reſort to his leſſons. They heard with attention and diligence; and were ſure, in all companies where philoſophical ſubjects were ſtarted, far to outſtrip their opponents. This expoſed Wolfius to much envy and jealouſy; a melancholy proſpect for ſcience and learning! Nor was the argumentum ab invidia, as Le Clerc calls it, omitted on this occaſion.

The people of Leipſic ſoon ſaw, what they had loſt in Wolfius, and would fain have perſuaded him to return. This he refuſed, thinking it unbecoming him, not having been quite a year at Halle.

In the year 1709, Wolfius gave the firſt edition of his Aërometria, in Latin, (a new ſcience, with which he enriched mathematics) in its kind a maſterpiece. He thereby manifeſted, not only his abilities in natural philoſophy, conſidering the difficulty of ſuch a ſubject, as the air; but his methodical, ſyſtematic turn. Next after Otto Guericke, the world is moſt indebted to Wolfius, with reſpect to this ſubject. This performance procured him the honour to be voluntarily and unanimouſly choſen a member

member of the Royal Society of London. The Academy of Berlin ſoon followed the example; thinking it a reproach, that foreigners ſhould take notice of a man, whom they themſelves neglected.

About the ſame time, Wolfius publiſhed his German Elements of Mathematics, in four volumes 8vo; then his Tables of Sines and Tangents. The former was received with univerſal approbation, and has paſſed through ſeveral editions. The plainneſs, order and ſolidity of this book are admirable.

In the year 1712 came out his Logic, in German; which, though ſmall in bulk, abounds in uſeful rules, both for the diſcovery, and for the manner of propoſing truth: it is purged from all the droſs of the ſchools; holds the mean between Ariſtotelic ſubtleties, and the looſe, unconnected manner of Ramus, Deſcartes, and other modern Logicians. It is therefore no wonder, that it has gone through ſeveral editions.

In the year 1713, Wolfius publiſhed his Latin Mathematical Elements, in two volumes 4to, which procured him ſuch reputation, that upon the death of Planer, mathematical profeſſor at Wittemberg, the King of Poland gave expreſs orders to invite Wolfius to that chair. Wolfius did not chuſe to quit his then ſtation, without

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the King of Pruſſia's permiſſion. The King, ſenſible of what Halle ſhould loſe in ſuch a man, was deſirous of retaining him by every encouragement both of honour and emolument; he accodingly made him a privy counſellor, and gave him an additional ſalary. To teſtify his gratitude, Wolfius continued at Halle, and declined the invitation to Wittemberg.

This ſolicitation was ſcarcely over, when Peter the Great gave him a call to Peterſburg, on the moſt advantageous terms. This great Prince, worthy to be had in eternal remembrance, and who tried every method to civilize his barbarous ſubjects, had, for that purpoſe, procured learned men from all quarters, whom he wanted uſefully to employ in his great deſigns: and theſe men continually offering new ſchemes and inventions to his conſideration, he choſe to have had Wolfius about his perſon, to give his judgment on them. Wolfius was juſt on the point of accepting this offer, when Leibnitz diſſuaded him from it.

In the year 1716, Wolfius publiſhed his Lexicon Mathematicum. For though well appriſed, that mathematics are only to be learned in a connected manner; for which he had already made ſufficient proviſion, by his Latin and German writings on that ſubject; yet he conſidered, that many, who

who never had an opportunity of ſtudying mathematics in a regular manner, might reap ſome benefit from a work, in which they ſhould find the technical terms properly explained; he therefore undertook this work.

About the beginning of the ſame year, on the 17th of March, the firſt remarkable Aurora Borealis, or Northern Light, was obſerved in Europe. This greatly drew the attention of philoſophers: and nothing was more natural, than to expect many hiſtorical deſcriptions of this phenomenon. The different accounts of, and conjectures concerning which, Wolfius compriſed in a ſmall writing, which he inſerted in the Acta Eruditorum: and he himſelf drew up a treatiſe on the ſubject in German.

The ſame year Leibnitz, on his return from Vienna, where he endeavoured, but in vain, to eſtabliſh an academy of ſciences, came to Halle. This great man, who laid himſelf out in promoting the happineſs of mankind, warmly exhorted Wolfius to proſecute his diſcovery concerning the multiplication of corn. This diſcovery was made as early as the year 1709, and lay dormant, till Wolfius was thus excited by the admonitions of Leibnitz.

In the following ſpring, of 1717, Wolfius had a wooden box made, which he filled with good garden-mould, in which he

he ſtuck deep ſome grains of barley, ſoaked in fat and ſaline matters, and ſet at ſome diſtance from each other. The box was laid in an open place, expoſed to ſun, dew and rain. The reſult was, that one ſingle grain yielded fifty ears; each ear, thirty grains, and thus, in all, an increaſe of one thouſand and five hundred grains. This method was afterwards tried in the large way in the field, in Sileſia and Luſatia, and was found to anſwer extremely well. The treatiſe on the ſubject came out in 1718, intitled, A diſcovery of the true Cauſe of the wonderful Multiplication of Corn.

Much about this time, Wolfius publiſhed a Compendium of his German Elements of Mathematics, for the benefit of beginners, to whom his larger Elements might ſeem too prolix and difficult. Never, ſure, had any one a greater talent of ſuiting himſelf to meaner capacities: whether we aſcribe this to his peculiar knowledge of, and deep inſight into, human underſtanding, or to an ardent deſire of being ſerviceable, even to the overlooking his reputation; it is equally to his honour. He alſo inſerted in the Acta Eruditorum, new geometrical propoſitions on the nature of all parabolas, hyperbolas, &c. and publiſhed a ſhort Life of Leibnitz, who died in 1716. On this ſhort ſketch, Fontenelle formed

formed his Eulogium, inſerted in the Memoirs of the Royal Academy of Sciences.

In 1718, came out his Ratio Prælectionum, in 8vo, and a new edition in 1735, with an additional account of his Lectures on Grotius. The calumnies of his enemies forced him to this publication. This Account of his Lectures gave general ſatisfaction; was of uſe to his pupils, and may be a pattern to all academical profeſſors.

In 1719, appeared his Metaphyſics, or Rational Thoughts on God, the World, the Soul of Man, and on all things in general, compriſing four diſtinct ſciences under one common appellation. Wolfius perfectly well foreſaw the ſtorm this book would raiſe, and therefore ſubjoined an advertiſment, ſignifying in what manner he would treat objections. Metaphyſics happened to be in great diſcredit at that time, were conſidered as quite uſeleſs, as only a lexicon of barbarous terms: while it was not conſidered, that there are certain general principles, and firſt notions, which are to be the baſis and leading notions in all the other ſciences, not excepting mathematics; and without which, neither the being of God could be demonſtrated, objections of ſceptics obviated, nor any thing ſolid advanced concerning the human

ſoul; nor, in fine, a way paved for juſt demonſtrations in morality.

In 1720, Wolfius publiſhed his Moral Philoſophy, founded on the metaphyſics, and compriſing the law of nature, and morality properly ſo called. Some have objected to his fundamental principle; viz. 'Do every thing, that can render you perfect; avoid every thing that can make you imperfect:' decrying it as intereſted. This book contains the juſteſt notions of virtue and vice, with the nobleſt motives to practiſe the former, of any book extant.

In 1721, came out his Civil Philoſophy, or Politics: wherein he applies the Law of nature to ſociety in general, to ſmaller and larger ſocieties, to œconomics, republics and ſtates. Here the moſt perplexed queſtions are ſet in the cleareſt light. It is properly a manual for princes and ſtateſmen, and the philoſophy of kings.

To this calm and ſunſhine, as is the manner in human affairs, ſucceeded the moſt violent ſtorm. Wolfius, from a ſincere regard to the benefit of his pupils, often inculcated the neceſſity of diſtinct notions in all the ſciences; and the reducing obſcure and confuſed notions to ſuch, by help of philoſophy. The profeſſors of thoſe ſciences highly reſented this; but their rancour and hatred were heightened in a particular manner, when Wolfius's

pupils,

pupils, at their lectures, objected either to their definitions as defective, to their demonſtrations as looſe and unconnected, or to their arguments as inconcluſive; loudly giving out, that he overturned every thing held ſacred and valuable among men, and wounded it through their ſides. This the fate of Socrates! when charged with corrupting youth, and ſetting them againſt the laws and religion of their country.

In the year 1721, Wolfius laid down his prorectorate, and, as uſual, pronounced a diſcourſe on that occaſion. His theme was the celebrated morality of the Chineſe, and their great philoſopher Confucius. After running out in encomiums on their moral philoſophy, he ventured to make a compariſon of it with his own; and the coincidence and harmony between them, a matter of honour and boaſt. From this, his enemies unfairly concluded, that he adopted all their erroneous opinions concerning God and things divine. The Dean of the Theological Faculty inſiſted on a copy of the diſcourſe, which Wolfius conſtantly refuſed, with this ſting added to the refuſal, that they were incapable and incompetent judges.

Strahler, a quondam pupil of Wolfius, was employed by the divines to write againſt his maſter. Fair promiſes and a proſpect of reward are ever prevalent with low

low and mercenary minds, and gratitude is ſure to fall a ſacrifice. Nothing is eaſier than to ſtart objections, and the weakeſt heads are the moſt prolific. Strahler drew up an Examen, as he called it, charging Wolfius with the moſt dangerous opinions. The greateſt reputation, of this kind, is ſeldom any better than that of Heroſtratus, who fired the temple of Diana. Strahler's Examen and name are now almoſt forgotten, while the works and name of Wolfius are, with large ſtrides, advancing to immortality. The King himſelf, in a ſevere reprimand to the univerſity, reſented this treatment, as againſt all the rules of good order and common decency, for a ſcholar thus to preſume to attack his maſter.

Wolfius's enemies were ſtill reſtleſs; they drew up an index, or liſt, of pretended errors contained in his writings, which they put into the hands of the Dean of the philoſophical faculty; who ſent it to Berlin, as the act of the whole faculty, though moſt of the members were againſt it. The King, contrary to the expectations of his enemies, ordered the liſt to be ſent to Wolfius, commanding him to give in an anſwer.

One article of accuſation was, his maintaining, that God, by one eternal and wiſe decree, had pre-ordained and pre-determined all things. Again, his holding, that

the eſſences of things, by which he meant their bare poſſibility, were eternal and neceſſary, and that contingent things are hypothetically neceſſary, &c. We are ſorry, we cannot gratify the reader with the anſwers made to the ſeveral heads of accuſation, they not being found among Wolfius's papers. The only anſwer extant is that which he publiſhed in Latin, on the difference between an abſolutely neceſſary, and a wiſe connection of all things, juſt after Dr. Lange had publiſhed his Cauſa Dei, a book principally deſigned againſt Wolfius; from which it plainly appears, that he charges Wolfius with teaching a brutum fatum, a blind fatality. This the divines wanted to perſuade his Majeſty of, and hence aroſe all the perſecution.

The invitations from Peterſburg were ſtill repeated; nor leſs repeated, nor leſs urgent, were thoſe from Heſſe-Caſſel. But Wolfius did not chooſe to give his adverſaries any occaſion of triumph, who whiſpered about, that he was ſoon to be degraded of all his honours and employments, and baniſhed the whole empire: he rather choſe patiently to wait the King's final determination. The teſtimony of his own conſcience aſſured him, it could not fall out otherwiſe, than to his honour and full juſtification.

But how vain are the ſeemingly beſt-grounded hopes! The gods of this lower world ſometimes too plainly ſhew, that they are but men, and like other men, ſubject to be miſled, and warped by miſrepreſentations. The late King of Pruſſia, Frederic William, entertained a real regard for religion, and could bear nothing in his dominions in the leaſt detrimental thereto. So highly laudable as ſuch ſentiments were, it is the more to be lamented, that they were, on this occaſion, miſapplied to the hurt of an innocent man, by two favourites in a military capacity, who paſſed for religious perſons, and were equally with the King well-meaning patrons of religion, but the inconſiderate inſtruments of rancour, ſuperſtition and ignorance. How eaſy was it, in metaphyſical niceties, to impoſe on, and in an unguarded hour to ſurpriſe, perſons of their ſtation and rank in life?

The dreadful ſtorm of the King's diſpleaſure, ſo long a-brewing, ſo ardently wiſhed for on the one ſide, and ſo unexpected on the other, at length burſt forth. On the eighth of November 1723, an order was diſpatched to the univerſity, to ſtrip Wolfius of all his honours and employments, and to command him, in twice twenty-four hours to quit his Majeſty's

dominions, UNDER PAIN OF THE HALTER!

The royal mandate muſt be executed and conformed to in the ſtricteſt manner. And in twelve hours after, Wolfius quitted Halle, taking leave but of very few of his friends and acquaintance, and leaving behind him his wife big with child, and an only ſon, about a year old. He retired to Merſeburg, in the territory of Saxony. Here he revolved with himſelf, whither beſt to retire. He had, as we have ſeen, ſeveral invitations. After ſome deliberation, he reſolved on Marpurg. The Landgrave joyfully received him, and ſeven days after his expulſion from Halle, ordered letters of admiſſion to be diſpatched.

With the beginning of the year 1724, Wolfius commenced his leſſons at Marpurg, at which, in a little time after, there was a prodigious reſort of ſtudents from all parts of Germany, from Swiſſerland, Holland, Denmark and Sweden. The firſt book he publiſhed here was his Annotations on the Metaphyſics, in which he fully anſwered all objections.

The perſecution Wolfius underwent, was rather ſerviceable than detrimental. It put people on reading his books, in order to learn the reaſon of the clamour raiſed againſt him: and then they came to ſee,

not

not only the harmleſſneſs, but the ſolidity of his doctrine. And thus the enemies of truth, contrary to their intention, often ſerve to eſtabliſh it.

In the mean time, the enemies of Wolfius were not idle. They prevailed on Dr. Buddeus, of Jena, to give his opinon on Wolfius's philoſophy. At length, teazed with their ſolicitations, he drew up, what he called, his Thoughts, which he ſent in manuſcript to the divines of Halle, where, without the Doctor's knowledge and conſent, they publiſhed them.

The great character and reputation of this new antagoniſt were more to be dreaded, than his reaſons or arguments. Wolfius was but too ſenſible of this. He had before taken little or no notice of his impotent aggreſſors, but here, it was impoſſible for him to be ſilent. It muſt be owned, that Wolfius is ſomewhat too bitter and ſevere in his expreſſions. But the charge laid againſt him, namely, that of atheiſm, was too atrocious, not to juſtify ſome warmth and vivacity; in the ſame manner that a perſon is juſtifiable, who, in a caſe of neceſſary ſelf-defence, kills his unjuſt aggreſſor on the ſpot.

During theſe tranſactions, came out his Diſcourſe on the Philoſophy of the Chineſe, which had raiſed ſuch unjuſt clamour; and then the world ſaw, how groundleſs

was ſuch an outcry, and how harmleſs this work. It paſſed through ſeveral editions afterwards, without the leaſt ſcruple or cenſure.

About the beginning of the year 1724, Wolfius had a new invitation to Peterſburg, which was again repeated towards the cloſe of the year. Peter the Great, 'tis true, died the beginning of 1725, but his intentions, with reſpect to the advancement of learning among his people, and his deſign of inſtituting an academy of ſciences, and of ſetting Wolfius at the head thereof, did not die with him. His illuſtrious conſort and ſucceſſor, the Empreſs Catherine, who came to all theſe grand projects as it were by ſucceſſion and inheritance, repeated the ſame invitations. But, on finding that he could not be prevailed on to quit Marpurg, nor his illuſtrious patron, the Landgrave, while he lived; the Empreſs was graciouſly pleaſed to make Wolfius an honorary profeſſor of the new academy, with a yearly appointment of three hundred dollars, which he enjoyed during life.

About this time, Wolfius publiſhed the two laſt volumes of his Natural Philoſophy, in German; the one, on final cauſes; and the other, on the uſes of the parts in the human body. Then followed, The Compleat Account of all his Philoſophical Writings, in German. And in order to accom-

accommodate ſuch readers, as were unaccuſtomed to a connected, ſyſtematic method in the ſciences, but who readily peruſe detached diſſertations, he publiſhed his Horæ Subſecivæ, or Leiſure Hours. In theſe, he wanted to ſhew the utility redounding from his method of treating philoſophy, to the other ſciences. Theſe Diſſertations form three volumes in 8vo, and contain an invaluable treaſure of various learning. They were publiſhed detachedly, every quarter of a year.

In the year 1730, died the Landgrave Charles, Wolfius's great patron. Frederic I. King of Sweden, came to the ſucceſſion: and his Majeſty, as well as the Stadtholder, William, continued to honour Wolfius with the ſame favour and protection, which he enjoyed under their late father, Charles. And when his Majeſty came to Marpurg, and was received by the univerſity, he was pleaſed to enquire, which was Wolfius? who coming forwards, the King expreſſed himſelf in the moſt gracious manner, aſſuring Wolfius of his favour and protection, and of all imaginable encouragement. And ever after, when any Swediſh gentlemen ſet out on their travels to Germany, his Majeſty was ſure to lay his injunctions on them, to pay a viſit to Wolfius, and greet him in the King's name. Nay, the King laid his commands on Wol-

fius to write to himſelf; and as often as he did, he always received anſwers in the King's own hand.

In the royal academy of ſciences at Paris, there are eight places for foreign members, called Aſſociés. On the Earl of Pembroke's death, in 1733, Wolfius was unanimouſly choſen to his Lordſhip's place, and the choice was confirmed by the King.

Wolfius had now been ten years at Marpurg, when the King of Pruſſia began to ſee his innocence. In November 1733, he ordered a letter to be written to Wolfius, expreſſing, that his Majeſty was entirely recovered from his unfavourable opinion concerning him, and making him an offer of his former ſtation in the univerſity of Halle, with the title of privy counſellor, and vice-chancellor of the univerſity, a yearly appointment of two thouſand dollars, and the aſſurance of his Majeſty's protection. Wolfius, after repeated ſolicitations of this kind, declined theſe offers, from a ſenſe of gratitude to his generous patrons and benefactors; which was graciouſly received both at Stockholm and at Caſſel, and properly rewarded.

During theſe ſtrong ſolicitations from Berlin, he had an invitation from Hanover. His Britannic Majeſty, George II. reſolved to execute a deſign, which had been long intended by his illuſtrious predeceſſors; namely,

namely, that of erecting an univerſity at Gottingen, for the greater advancement of learning in his electoral dominions. But Wolfius declined the offer, from the motive juſt mentioned.

The favourable diſpoſitions of the King of Pruſſia towards Wolfius no ſooner took air, but all the ſecret favourers of Wolfius's doctrine aſſumed courage, and began to raiſe their heads, holding public lectures on his philoſophy, almoſt in all the Pruſſian univerſities; a thing before prohibited under the ſevereſt penalties. And the great reſort of ſtudents was a plain proof of the favourable reception they met with.

Dr. Lange, as we may eaſily imagine, could not well brook this; namely, that a philoſophy, which he had with ſo much zeal endeavoured to ſuppreſs, ſhould again raiſe its head, under his noſe, at Halle. He therefore applied to the curators of the univerſity, that they would put a ſtop to ſo dangerous an innovation; and the more effectually to carry his ſuit, he waited on his Majeſty at Potſdam, after having obtained leave for that purpoſe. Here he tried every expedient, by repreſentation and by intreaties, to prevail on his Majeſty to come to a reſolution. But the King being determined to proceed with deliberation, ordered Lange to draw out a liſt of the principal errors: which being done,

done, a copy was ſent to Wolfius, in order to put in his defence; and another was given to Dr. Reinbeck, who drew up a probable or preſumptive anſwer to the ſeveral heads of error, with which Wolfius's own anſwer was afterwards found ſurpriſingly to agree. But the King declined determining in this affair, ſubmitting it to the deciſion of perſons ſkilled in this debate; who, after a full diſcuſſion of the merits of the cauſe, abſolved Wolfius from all ſuſpicion of error.

Upon this ſolemn determination, Wolfius's good cauſe prevailed, as well in the mind of the King, and of the whole court, as of every impartial perſon in Germany. Lange and his ſuit were diſmiſſed, and the profeſſors in the Pruſſian univerſities were permitted the ſame liberty of reading lectures on Wolfius's philoſophy, as in the other univerſities of Germany.

I have hitherto, on account of the many remarkable occurrences that have intervened, omitted making any mention of the editions of his larger Latin works: here then I take up that ſubject.

His Philoſophia Rationalis, or Logic, came out in the year 1728, in 4to, with a dedication to the then Landgrave, Charles, of Heſſe-Caſſel; in which, after mentioning the arduous and perilous taſk he undertook, namely, that of reducing the

whole of philoſophy to a ſtate of certainty and utility, he thankfully acknowledges the generous and powerful protection his patron was pleaſed to honour him with, againſt the rancour and malice of his enemies; whoſe intereſt it ſeemed to be, that philoſophy ſhould ſtill continue in its then ſtate of obſcurity and uncertainty.

In 1730, Wolfius publiſhed his Philoſophia Prima, the Firſt Philoſophy, or Ontology, dedicated to Frederic I. King of Sweden. This branch of philoſophy had been, as Wolfius obſerves, in the higheſt repute among the ſchool-men; but that after the Carteſian philoſophy came to prevail, it fell into diſrepute; being conſidered only as a barbarous philoſophical lexicon, in which the definitions were more obſcure than the terms defined; and the canons, as they were called, no leſs obſcure, than they were ambiguous. But on enquiring into the nature of the evidence of Euclid's demonſtrations, he found, that it depended, excluſive of the form or juſt illation, on ontological notions: that Euclid's firſt principles are nominal definitions, and axioms, moſt of which are ontological propoſitions; and that thus mathematics are indebted to ontology for all their certainty: and that on attempting demonſtrations in philoſophy, in order to a legitimate deduction of the predicate from the determina-

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tion or notion of the ſubject, and alſo on attempting the reduction of philoſophical principles to indemonſtrable propoſitions, he found, that in all theſe, equally as in the mathematics, he could at length reſolve them into ontological notions. So that he had not the leaſt doubt, that philoſophy could not be treated ſcientifically, ſo as to become both certain and uſeful, till ontology was treated in the ſame ſcientific manner. That ontology alſo contains the principles of the art of invention; as alſo thoſe of the logic of probability, one of the grand deſiderata, according to Leibnitz, in the ſciences.

Next followed in order, in the year 1731, his Coſmologia Generalis, a new ſcience in philoſophy, dedicated alſo to Frederic I. of Sweden, who had then ſucceeded his father in the Landgraviate of Heſſe-Caſſel. This, Wolfius calls the Tranſcendental Coſmology, and defines it, the ſcience of the world or univerſe in general, as it is a compound and modifiable being. He aſſerts its uſe to be indiſpenſable in natural theology and in phyſics; as from its principles, we demonſtrate the being of God: and that the contingency both of the world, and of the order of nature, together with the impoſſibility of a pure chance obtaining therein, are ſo many ſteps, by which, from this viſible world, we aſcend to God. And that coſmology

alſo furniſhes directive or leading notions in natural philoſophy.

The year following, viz. 1732, produced the Pſychologia Empirica, or the Doctrine of the Soul drawn from Experience, dedicated to the Landgrave, William, Stadtholder of Heſſe-Caſſel. The ſecond volume of this work; namely, the Pſychologia Rationalis, did not come out, on account of the troubles of the year 1733, till 1734. And this he inſcribed to Frederic, hereditary Prince of Heſſe-Caſſel. In it he aſſigns the reaſons of all that which we learn from the empirical or experimental pſychology.

The Theologia Naturalis he divided into two parts. In the firſt, which came out in 1736, he demonſtrated the being and attributes of God, from our ſenſible experiences: and this he dedicated to the then Biſhop of Bamberg and Wirzburg, Count Charles of Schonbron, a great judge and patron of learning.

In 1737, he publiſhed the ſecond part of the Natural Theology, and inſcribed it to the celebrated Cardinal Fleury. This book will ever remain a laſting monument of the great abilities of Wolfius; therein he demonſtrates, in the moſt ſolid and convincing manner, the moſt important truths concerning God, in oppoſition to Spinoſiſts, Pantheiſts, Epicureans and Sceptics.

In

In the year 1738, he dedicated the firſt volume of his Philoſophia Practica Univerſalis, or General Practical Philoſophy, to the learned Cardinal Polignac, the ornament both of his country, and ſtation in the church.

Wolfius, to expreſs his gratitude for the King of Pruſſia's late act of juſtice towards him, dedicated to his Majeſty the ſecond volume of his Practical Philoſophy, in 1739; which was graciouſly received by the King, who propoſed a ſettlement for Wolfius at Francfort on the Oder, and that on his own terms; which Wolfius declined, as he did three other ſolicitations the ſame year, either to Halle or to Francfort.

In 1740, Wolfius had an invitation to Utrecht, to ſucceed, in the mathematical and philoſophical chairs, the celebrated Muſchenbroek, who was removed to Leyden: but Wolfius could not be prevailed on to quit Marpurg. This was reſerved for the preſent King of Pruſſia; to whom, when Prince Royal, Wolfius dedicated, the ſame year, the firſt volume of the Law of Nature, which was graciouſly received, as appears by a letter written to Wolfius, with his own hand, eight days before the death of the King, his father; where, among other things, he ſays, 'it was the 'buſineſs of philoſophers to be the in-'ſtructors of mankind, and the preceptors

'of

' of Princes: their province was to think,
' that of Princes to act, conſequentially:
' their duty to inſtruct the world by rea-
' ſoning, that of Princes, by example.'

His Royal Highneſs no ſooner aſſumed the reins of government, on the death of his father, the late King, than he began to think of recovering Wolfius again to his dominions. The only difficulty with Wolfius was, in what manner to act in this caſe, without incurring the charge of ingratitude to, or falling under the diſpleaſure of, his generous benefactors and patrons, the King of Sweden, and the Stadtholder of Heſſe-Caſſel. His Pruſſian Majeſty took upon himſelf to aſk his diſmiſſion from the King of Sweden, to ſave Wolfius any diſagreeable reflections or ſcruples on that head: and his Majeſty applied for, and actually obtained his diſmiſſion.

This happened in the beginning of November, 1740: on the 30th, he ſet out with his family from Marpurg, to the no ſmall regret of the people of that town, and arrived at Halle on the 6th of December, to the great joy of the inhabitants, who received him with all poſſible marks of honour and diſtinction.

Wolfius, after his quiet ſettlement at Halle, proceeded in his publications, and in 1742, publiſhed his ſecond volume of the Law of Nature, which he dedicated

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to the King, as he had dedicated the firſt to him when Prince Royal.

In 1743, came out his third volume, dedicated alſo to the King. This year he was appointed Chancellor of the univerſity of Halle, having been Vice-Chancellor before.

In the year 1744, his fourth volume of the Law of Nature was publiſhed, which, in the ſame manner as the preceding volumes, was graciouſly received by the King.

About this time, Voltaire paſſing thro' Halle, waited on Wolfius; and the ſtudents, as is cuſtomary, preſenting their memorial books to Voltaire, he wrote therein, as follows; *Wolfio philoſophante, Rege philoſopho regnante, & Germania plaudente, Athenas Hallenſes inviſi.*

In 1745, Wolfius publiſhed his fifth volume of the Law of Nature, which he dedicated to Zaluſki, Biſhop of Cracow and Chancellor of Poland, a great patron both of learning and of learned men; who, together with his brother the Crown-Referendary, wanted greatly to promote the ſtudy of the ſciences in Poland.

This very year the Elector of Bavaria, then adminiſtrator of the Empire, raiſed Wolfius to the dignity of a Baron. But Wolfius referred it to the King of Pruſſia, his maſter, whether he ſhould accept or decline

decline this honour. The King not only congratulated him upon it, but ordered, that in all his dominions he ſhould be conſidered as a Baron of the Empire. Wolfius took occaſion to return his Majeſty his moſt humble thanks in the dedication of his ſixth volume of the Law of Nature, which came out in 1746.

As Wolfius had now carried on this extenſive work to the ſixth volume, his Majeſty was pleaſed to expreſs his apprehenſions, that the great length of it would diſcourage the reader. Wolfius, on publiſhing the ſeventh volume, in 1747, and the eighth in 1748, apologized, and accounted for this great length; with which his Majeſty was pleaſed. However, Wolfius, from this opinion of his Majeſty, took the hint of drawing up a ſhort abſtract of the whole Law of Nature, for an academical book to read lectures on.

Wolfius, though now advanced in years, was far from being idle. In 1749 he publiſhed the Law of Nations, which he dedicated to the Prince of Orange, in acknowledgment of the honour his Highneſs had done him, in ſending him one of the gold medals, that were ſtruck on occaſion of this Prince's ſudden and unanimous advancement to the Stadtholderſhip.

The year following, viz. 1750, came out the firſt volume of the Moral Philoſo-

phy, which he inſcribed to Charles, Duke of Brunſwic. In this volume he teaches, in what manner to improve the underſtanding and the other intellectual faculties, and how to arrive at the intellectual virtues, as they are called.

In 1751, came out the ſecond and third volumes, treating on the manner of amending and improving the will; and how the regulation of the ſenſual deſires muſt be made the ſource of the moral virtues: both theſe volumes were dedicated to the Biſhop of Cracow.

In this work, Wolfius proceeded in the ſame manner as he had all along done in his former works: he drew propoſitions, duly limited and properly determined, either from firſt principles, or from propoſitions previouſly demonſtrated; and after demonſtrating them in a ſolid manner, for the greater benefit of every reader, he everywhere ſubjoins illuſtrations and remarks, by way of notes. But he principally ſhewed the perfect juſtneſs of his practical rules in morality, both from the nature of the ſubject, or the things treated of, and from the diſtinct knowledge of the powers of the ſoul: of all which there is not the leaſt trace to be found in other ethics or books of morality, the authors of them being deſtitute of this neceſſary degree of penetration or inſight. It is therefore no wonder,

der, if his doctrine of morality has a quite different reputation from that of other writers. Moſt moral writers had blended the duties of the law of nature with thoſe of morality; and proceeded altogether in a theoretical manner, leaving the practice to the reader, without giving themſelves any trouble to facilitate it. Wolfius drew up in the ſame manner as the former, the fourth and fifth volumes of his Moral Philoſophy, which came out in 1752-53; and with them concluded the doctrine of morality.---In the year 1752, he was admitted a member of the academy of Bologna.

Thus Wolfius concluded this important work of Morality, which, as was hinted above, he had planned in his youth, but did not execute till above ſeventy years old. He no ſooner became maſter of the mathematical method of demonſtrating, which coſt him much labour and time, than he ſaw, that moral, as well as civil philoſophy, borrow all their principles from the law of nature and nations, as theſe pre-ſuppoſe pſychology and natural theology, and this laſt, coſmology, from which it borrows its principles of demonſtration; and that at length, all certainty is reſolvable into ontological notions, or the notions of the firſt philoſophy. And thus he underſtood, that his undertaking

would run into great length, and not be ſo ſoon nor ſo eaſily accompliſhed.

Wolfius next proceeded to the civil philoſophy, or politics, and made a beginning therein with the œconomics, or the manner of managing a family. This laſt is the leaſt of compound ſocieties, but from which the greater take their riſe, and whoſe conſtitution and government exhibit a picture in miniature, of the conſtitution and government of larger ſtates. Wolfius had finiſhed the conjugal ſociety, and the duties to be practiſed therein, and was advanced to the ſecond, or parental ſociety, viz. that between parents and children, and had compleated all he had to ſay, with reſpect to the care of the former in bringing up the latter, when the laſt days of his life drew near, and a complication of diſorders ſnatched the pen out of his unwearied hand.

Before I proceed to give a particular account of the circumſtances of his death, I muſt firſt mention, what he intended to go upon, after finiſhing the Politics.

He regretted, that he could not accompliſh the important work, which he had planned when young, but that he muſt leave it for the greateſt part unfiniſhed.

In the general phyſics he propoſed to ſhew, in what manner we are to make a true diſtinction between what is phyſical, mathe-

mathematical, and metaphyſical therein; which laſt, however, is the ſource of all the ſenſible appearances or phenomena of nature. He wanted to ſhew farther, in what manner to ſeparate the imaginary, from what is real in bodies; and laſtly, to point out, what judgment we are to form of hypotheſes, or arbitrarily-aſſumed propoſitions, in order to prevent their being detrimental to the truth, in the explanation of the phenomena of nature: and he found, that the ſame remark was neceſſary to be made, with reſpect to the notion of *Forces*. For though at this day mathematicians uſe the term, *Dynamic*, yet that they were gone very far from the ſentiments of Leibnitz on that head: and even in the Dynamics, the mathematician blends ſomething that is imaginary, though without detriment to what metaphyſics teach.

Now the more important theſe ſeveral particulars are in the eyes of every intelligent perſon, the more it is to be regretted, that providence did not think fit he ſhould live to accompliſh them. However, I can with pleaſure mention, that Mr. Hanow, a quondam pupil of Wolfius, a learned philoſopher of Dantzic, undertook to compleat the Politics, begun by Wolfius; which he has now actually accompliſhed, and is ſaid to be going on

with the other parts, that were left unfiniſhed.

Our philoſopher, as has been ſaid, very early formed the deſign of improving the practical philoſophy, as Deſcartes had attempted the ſpeculative. To this end all his labours tended, from the very firſt diſſertation he publiſhed, of which mention is made above, and by defending which, he obtained at Leipſic the liberty of holding public lectures. And for that reaſon only it was, that he applied himſelf to the ſtudy of mathematics, in order to make himſelf maſter of the mathematical method: and for the very ſame reaſon, he ſought previouſly to purge metaphyſics of its vague notions and ambiguous canons; and in particular, to ſet the knowledge of the powers of the ſoul in a clearer light than had ever been attempted; without which he could never hope to eſtabliſh the knowledge of moral duties on a right footing, nor arrive at demonſtration in morality.

After having finiſhed the univerſal practical philoſophy, in which he laid down the general principles of the ſeveral branches thereof, he next ſet about its principal part, namely, the Law of nature; and that, becauſe he wanted to draw from the principles of reaſon, in one connected ſeries, every caſe, that could poſſibly happen

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to a man, whatever ſtate of life he was in. The laws of the Greeks and Romans were not mere arbitrary conſtitutions, but the reſult of the deepeſt reflection, and natural equity and reaſon, their genuine ſource. If mere practitioners in the law did not ſee this, it was the buſineſs of a philoſopher to ſhew it in a compleat body of the law of nature. And this affords a ſufficient anſwer to thoſe, who complain of the prolixity of Wolfius, not only in the other branches of philoſophy in general, but particularly in his law of nature, and in his moral philoſophy: though, at beſt, it be but a lame inference; namely, Wolfius's works are too prolix (if not unneceſſarily ſo), therefore are good for nothing: the uninterrupted chain of connected reaſoning he wanted to carry on, indiſpenſably required ſuch prolixity.

Others object to our author's Latinity, charging him with bringing back that barbariſm which was ſo juſtly exploded: but new notions, and new combinations of notions, require new terms, which poſſibly may not be found authoriſed by any claſſical writer. Beſides, not ſo much, elegance and terſeneſs of phraſe, as propriety, perſpicuity and diſtinctneſs, are the virtues and excellencies of a philoſopher: and, if it can be any apology in his favour, Wolfius's ſtile is in nothing inferior to that of

Deſcartes, Hobbes, Newton, &c. Again, Wolfius never diſcountenanced the fine arts; on the contrary, recommended them as highly neceſſary.

The folly and impertinence of ſome pretended followers of Wolfius, have been laid to the maſter's charge: ſuch as the pretence of demonſtrating the myſteries in religion in the mathematical manner, and of reducing grammar, and almoſt every thing elſe, to that method. Wolfius, ſure, can never be juſtly charged with the extravagance of ſuch pretenders. His method remains good and ſolid, though never ſo much abuſed and miſapplied. It never once entered Wolfius's thoughts to explain myſteries from principles of reaſon, much leſs to demonſtrate them. He ever carefully diſtinguiſhed theſe two lights; namely, revelation and reaſon, and never approved thoſe who blended them together.

But ſhould any one object to the prolixity of Wolfius's demonſtrations, which often pre-ſuppoſe ſome hundred truths, as premiſſes, to a ſingle propoſition; or, as others alledge, that he attempts, with great formality, and at great length, to demonſtrate truths, of which no one ever doubted. In anſwer to this, it may be obſerved, that to a ſolid knowledge of the truth, it is abſolutely neceſſary, that, tho' never called in queſtion, we ſhould underſtand

ſtand it, as ariſing from its genuine principles: it is the demonſtration, and not that a truth was never queſtioned, that firſt conſtitutes it truth: only we are to guard againſt the ridicule of ſetting ourſelves to demonſtrate truths never doubted of, in a formal manner, indiſcriminately on all occaſions. This is only to be done in ſuch writings alone, as are purely allotted to a whole ſcience; ſuch as Wolfius's extenſive work on the law of nature. Indeed, nothing is more common, than for error to paſs in the world for truth, and truth for error: general aſſent therefore can never be made the ſtandard or criterion of truth; a demonſtration, or a ſolid proof, is undoubtedly a much firmer foundation. Our author was therefore at no unneceſſary pains or expence of thought in his demonſtrations.

Again, ſome people ignorantly aſk, what new diſcoveries Wolfius ever made? calling him a mere gleaner of well-known truths, and thoſe of old ſtanding; or, more contemptuouſly, a laborious compiler. The great ſervices of eminent men conſiſt not always in new diſcoveries. Shall we make no difference between a huddled jumble of various, looſe and unconnected materials, thrown together at random; and thoſe very materials regularly and properly diſpoſed, ſo as to form one ſolid and well-compacted body?

body? And this Wolfius has done. We alſo allow, that Wolfius's writings contain many common truths: but this they muſt do, from the very nature of his deſign; namely, the linking together truths, both known, and unknown till then, in one continued chain. With ſuch poor weapons, thus, have envy and ignorance attempted to overthrow the monument erected to the honour of Wolfius. But it is really an inſult on the underſtanding of the reader, to have condeſcended to take any notice of them.

No one ever performed ſo important and ſo univerſal a ſervice to learning in general, as Wolfius has done, by bringing the ſeveral parts of philoſophy into one comprehenſive, connected view. Ariſtotle, indeed, among the ancients, may be ſaid to have made an attempt towards it. But the merit of Wolfius is certainly not to be confined to this particular, great as that is in every reſpect: he has, moreover, enriched the ſeveral parts of our knowledge with ſomething new; mathematics with the treatiſe on the mathematical method, and with a new ſcience, viz. aërometry, in which he has diſcovered ſeveral new truths. He has enlarged the doctrine of logic with the genuine theory of demonſtration, and with the manner of inveſtigating new truths by means of Syllogiſm; and added the diſtinc-

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tion of compleat and incompleat notions to Leibnitz's diviſion of notions. He has, moreover, incorporated into metaphyſics an entire new ſcience; namely, coſmology, or the doctrine of the world in general, which contains innumerable new truths: in the pſychology, or doctrine of the ſoul, he was the firſt who pointed out the connection of our thoughts by means of ſyllogiſm, and in conſequence of the laws of the imaginative faculty. We ſhould never have done, were we particularly to point out what he has performed in morality, politics, and natural philoſophy. For farther information on this head, we refer to profeſſor Ludovici's German Hiſtory of the Wolfian Philoſophy.

In the year 1716, Wolfius married a young lady of Halle. For ſome years, this marriage ſeemed to promiſe no iſſue: his eldeſt ſon Ferdinand, now Baron Wolfius, was born in 1722. His ſecond ſon Chriſtian died very young; and a third ſon was ſtill-born.

In his œconomy, Wolfius was ſo regular, as from the time he left Breſlaw in 1699, till the laſt days of his life, to keep a regular account of all his diſburſements and receipts: a plain proof of a regular head, who himſelf practiſed, what, in his moral philoſophy, he recommended to others.

About

About the year 1747, he purchaſed a conſiderable noble fee or manor, not far from Leipſic, called Klein Dolzig, in the territory of Merſeburg; which he rather intended for his ſurviving ſon, as a manor ſuitable to his quality, than with a view to take any vain title from it himſelf, never ſubſcribing himſelf by any.

For ſome years Wolfius had been afflicted with the gout, which, a little before his death, ſeeming to go off, was ſucceeded by a cholic and violent conſtipation: his ſleep was reſtleſs, and his appetite gone: ſweating afforded relief for ſome time, till the gout, complicated with a fever, returned, and ſo weakened him, that he foreſaw his approaching end. In this extremity he had his recourſe to the mercy of God in Chriſt, with ſuch full aſſurance of faith, as deeply to affect the aſſiſtants, breaking out into theſe his laſt words, *Lord Jeſus, my Saviour, ſtrengthen me in this important hour!* Then he loſt his ſpeech, and in about two hours after, calmly expired, on the 9th of April 1754, at the age of ſeventy-five years, two months and ſixteen days.

He ordered, that he ſhould be buried without any funeral pomp or ſhew, and that no panegyrics or elegies ſhould be ſuffered to be publiſhed.

In ſtature, Wolfius was of a middle ſize, approaching rather to the tall and ſightly, than to the low and ſhort. His conſtitution of body was firm and well-ſet, neither loaded with over much fat, nor yet to be called thin. His form was manly, his eye quick and lively, his forehead open and ſerene, his noſe ſomewhat bent or hooked, and his mouth, in ſpeaking, always wore a ſmile. His voice was diſtinct, ſtrong, and ſlow, ſo that he could be plainly heard in a large hall or auditory. In his leſſons he was ſomething jocular and merry, nay, at times, biting and ſarcaſtic; eſpecially when he touched upon the defects and errors of ſome learned men, into which their confuſed notions, and deceptious reaſonings betrayed them. His behaviour in company was grave and ſerious, yet ſo as to gain the reſpect and love of every one. Among ſtrangers, who might have an eye upon him, he was ſhy and reſerved; ſpoke but little, and never engaged in any learned diſpute. He has often referred thoſe who have aſked his opinion on certain ſubjects, (in order to be troubleſome and impertinent with their objections) to his writings, where he had handled ſuch ſubjects.

His powers of mind may be better ſeen from his writings, than deſcribed and pictured; yet they may briefly be drawn thus: His memory was none of the ſtrongeſt; and

and he leaſt of all applied himſelf to thoſe branches of knowledge, which moſt promote and ſtrengthen it, ſuch as philology and hiſtory: on the contrary, his powers of underſtanding and judgment were ſo much the ſtronger. The mathematical ſciences, to which he had devoted himſelf from his youth, and the philoſophical ſtudies, which he ever combined therewith, had conveyed ſuch a degree of diſtinctneſs into his notions, that he ſought and found light there, where a thouſand others groped in darkneſs, while they remained ſatisfied with confuſed notions: and hence, his judgment ſcarce ever deceived him, and he perfectly well knew, how to be on his guard againſt the falſe glimmering light of the imagination, whereby ſo many philoſophers and mathematicians have been deceived and abuſed. By which means, and by the inveſtigation and practice of the mathematical method, his reaſoning faculty became ſo ſtrong, that he could with eaſe ſurvey the connection of innumerable ratiocinations.

This connection of truths, which, before his time, prevailed only in the mathematical ſciences, his extraordinary genius firſt introduced into metaphyſics, and then into all the other philoſophical ſciences. Every truth was in his view, changed into ſo many links of an extenſive chain;

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or more properly, into ſo many branches of one common trunk, from which they all ſprung. This was his own peculiar work, and the great pre-eminence he had in underſtanding, above all his predeceſſors. They, it is true, endeavoured after ſolidity and connection in their opinions, and even attempted to treat philoſophical ſubjects mathematically: as Deſcartes, for inſtance, thus attempted to make out the exiſtence of God; and Spinoſa, to handle morality in the mathematical manner. Yet neither of them ſucceeded, even in a tolerable degree. Nay, the appellation of a glimmering twilight is too high an encomium for all their attempts, if compared with the broad day of the Wolfian method.

He had, above all, the moſt exalted notions of God, his attributes and works, the whole of which he has ſet in an eminent degree of light, for which Leibnitz in his Theodicee had laid the ground-work. No one ever demonſtrated from principles of reaſon, in ſo diſtinct a manner as Wolfius has done, the abſolute dependance of the creatures, with reſpect both to their eſſence and exiſtence. The rights of the divine power, wiſdom and goodneſs in the production of the moſt perfect ſyſtem, and beſt becoming God, are by him explained in the nobleſt manner; as Leibnitz had, indeed,

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determined, but never handled ſyſtematically and connectedly. On this perfect ſyſtem of the world, Wolfius grounded his profoundeſt adorations of the ways of divine providence, in all the occurrences of this life; in regard he was fully convinced, that whatever thing happens, has been ordained by the all-wiſe Author, for the beſt purpoſe that is poſſible. This conviction never admitted a murmur in his breaſt, even under his ſevereſt trials: for he was ever perſuaded, that whatever befel him would contribute to his own particular benefit, and the general benefit of the world.

It is well known, that the drawing compariſons between men of great eminence, in giving their characters, is often of good ſervice. Now, though I have already ſaid ſomething occaſionally to this purpoſe, yet I ſhall venture on a farther eſſay, in comparing our Wolfius with the greateſt men of his rank in the learned world. The firſt that offers in this reſpect is Deſcartes, the inventor of a new mode of philoſophiſing.

Deſcartes had the courage to ſhake off the yoke of the ſchools, and, with the aſſiſtance of mathematics, to attempt ſomething new. In this reſpect he reſembles Wolfius; only that, in Germany, the way for freedom of thought had been already paved by Otto Guericke, Tſchirnhauſen, Thomaſius, and the two Sturmius's. And

if in this reſpect Deſcartes's courage and reſolution appear greater, yet the reſult of his endeavours was far inferior: Deſcartes rejected more than he ſhould, and pulled down more than he could again build up: to prejudices, he oppoſed indemonſtrable hypotheſes; and, in natural philoſophy, built caſtles in the air, which ſtood no firmer than the cobweb ſtructures of the ſchoolmen. There is ſcarce a ſingle propoſition, introduced by Deſcartes into phyſics, that has ſtood its ground, except what he has borrowed from Lucretius, Copernicus and Kepler. All his hypotheſes are vaniſhed like a miſt, and are no longer maintained by his own countrymen.

But Wolfius, on the contrary, has carefully ſought out, and purged from droſs, what Deſcartes had inconſiderately rejected, namely the general principles of metaphyſics: he has taught to lay down this ſcience, as the ground-work of all the other ſciences, and thereby rendered their ſtructure firmer and more ſolid. He deviſed no hypotheſes; his only ſtruggle was for truth, and that the ſure and ſolid truth. He manifeſted, if you will, leſs genius or wit, or a leſs ſprightly imagination, than Deſcartes, but greater force of judgment or reaſoning. In fine, he not only improved phyſics, as the Frenchman had attempted to do, but the ſeveral parts, both

ſpeculative and practical of philoſophy, unattempted by the other. In a word, Wolfius is a much more general philoſopher: and thus, Deſcartes is to be deemed rather his harbinger, than his rival or competitor.

The ſecond, who can enter the liſts againſt him, is Sir Iſaac Newton, the ornament and boaſt of Britain. It cannot be denied, but that, abſtracting from the enthuſiaſtic veneration, bordering on ſuperſtition, in which he is held by his countrymen, he was an extraordinary genius, a great geometrician, and, what is ſtill more, knew how to apply the abſtract truths and doctrines of geometry, to the explanation of the mundane ſyſtem. He diſcovered ſeveral laws of nature, and gave a greater degree of certainty to things, which a Kepler, a Galileo, a Huygens had already ſeen, or at leaſt ſurmiſed. Yet after all, he continued to be but a mere enquirer into nature: never once turned his thoughts to ontological truths; never dipped into the knowledge of the ſoul, and other ſpiritual beings; never engaged in enquiries concerning God, the law of nature, and concerning moral and civil truths.

But Wolfius accompliſhed all this in full meaſure; and if he yields the palm to Newton, in point of natural philoſophy, in many other reſpects he is his ſuperior. If Newton has, though innocently, by his

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attractive force, introduced again an *idolum tribus*, a national idol, Wolfius has ſought to demoliſh it, as an occult quality; and would have fully effected it, had he lived to execute his general phyſics. And thus, if the whole of the *Philoſophia Britannica* is confined barely to phyſics, or the knowledge of bodies, Wolfius has had the vigour of mind, to range uncontrolled through the extenſive field of truth; and, which is ſtill more, has had the ſkill to introduce connection and mutual dependance in all its parts: in a word, none, among all the philoſophers, can once pretend to vie with him, if we except Ariſtotle; though he is as far outdone by Wolfius, as our preſent knowledge in philoſophy outdoes that of the ancients.

As to the reſt, all the views of Wolfius were directed to the promoting human happineſs: this his ſeveral prefaces ſhew, but much more, all his endeavours, eſpecially in the practical philoſophy. This laſt, together with all its duties, directions and means of attaining to virtue, he has eſtabliſhed entirely on that deſire implanted in all men; namely, that of becoming more perfect: and thus he has taken the ſureſt way to impreſs on all, who have a love for themſelves, a love for virtue. His law of nature, and his moral philoſophy, will therefore be as laſting as this

propenſity ſhall remain peculiar to man. Neither the principle of ſociality, nor of mere ſelf-preſervation, have ever been ſo effectual as this, to give a ſtrong impulſe to every duty; or ſo extenſive, as to enable us to derive every duty therefrom.

PRE-

PREFACE

TO THE

FIRST EDITION.

A More excellent gift than the underſtanding, Heaven has not beſtowed on man: diſordered or weakened in this, he becomes either a child, or worſe than a wild beaſt; and thus unqualified to honour God, and be of ſervice to all his fellow creatures. So that the more he acts up to the character of a man, in the uſe of the powers of his underſtanding, the more he is entitled to the appellation. Every man therefore, but eſpecially whoever ſets up for the character of learned, ſhould exert himſelf in attaining the ready uſe of theſe powers. But yet, this is what very few employ their thoughts about, moſt people making learning a buſineſs of mere memory; and avoiding nothing ſo ſolicitouſly, as ſerious reflection. And hence it is, they have the utmoſt averſion from every thing, that re-

quires cloſe application and attention, and that leads to a dexterous and ready uſe of their underſtanding: on the contrary, are extremely fond of any idle tale, that amuſes, that requires no great effort to underſtand, and that keeps up that mode of thinking, which, from their youth, they have had in common with the unlearned herd. But the powers of the human underſtanding can no otherwiſe be known, than from the experience which we have in exerting them. So that thoſe, who are mere compilers of the thoughts of others, and unpractiſed themſelves in the buſineſs of invention, never once forming to themſelves any conception of a ſolidly demonſtrated truth, can leaſt of all know the powers and right uſe of the underſtanding; except what little they may have read thereof in good books. But beſides, that ſuch are very rarely to be met with on the ſhelves of bookſellers, I am afraid, were one, unexperienced in ſolid ſcience, to light on ſuch, he would ſcarce underſtand them.

And thus there is no other poſſible mean to arrive at this knowledge, than by learning to form juſt conceptions of ſolidly demonſtrated truths, and then examining, how they might have been found; and when by this means we attain to ſome practice in reflection, to endeavour to inveſtigate

veſtigate unknown truths ourſelves: and laſtly, to make it our buſineſs to enquire into the reaſon, why we gain ſo diſtinct a conviction from demonſtrated truths; and how it comes, that from a few known truths, we can draw others, till then unknown.

A perſon muſt be either loſt to all ſhame, or extremely ignorant, who would pretend to ſay, that out of the province of mathematics, truths as ſolidly demonſtrated, and diſcoveries as juſt and genuine, are to be met with, as therein. For out of the mathematical province, men either write in a quite different manner, or they attempt the mathematical method. In the firſt caſe, intelligent perſons obſerve much confuſion, fail not to complain, that the terms are either not at all, or ſeldom properly defined; that many things are aſſumed without any, and others, without a ſufficient proof, and often very erroneouſly proved. But in the ſecond caſe, no one has, to this day, ſucceeded, who wanted to employ the method of mathematical demonſtrations in the other diſciplines. *Deſcartes*, though a great mathematician, never more clearly ſhewed the weakneſs of his proof for the being of God, than when, at the perſuaſion of *Merſennus*, a very learned French monk, he propounded it in the geometrical manner. *Spinoſa*, in

his Ethics, and *Raphſon*, in his Demonſtration of God, have acquitted themſelves but poorly in the buſineſs of demonſtration, though both of them men of underſtanding, and no novices in mathematical knowledge. They define many terms by others equivalent or ſynonymous; aſſume undemonſtrated, that which often moſt required demonſtration, and ſometimes connect their ſyllogiſms illogically. And therefore the mathematical ſciences alone remain, from which we are to learn the genuine uſe of the powers of the underſtanding. And with this view I have, in my German Elements of Mathematics, made it my buſineſs to propound, as much as poſſible, every thing in ſuch a manner, as it might have been at firſt diſcovered, and in my colleges or lectures inculcate particular remarks, in order, as much as may be, to bring my hearers to a habit of reflection, againſt which, they have beſides, many rubs and impediments in the way. But I will here rather appeal to the teſtimony of others, than to my own experience. We generally hold Locke's Eſſay, as a work extremely ingenious. But to what, pray, does Locke himſelf aſcribe his ability of underſtanding, and what means does he recommend, in order to the attainment thereof? On conſulting his book on *the Conduct of the Underſtanding*, it will

be found, that he attributes all his penetration to mathematical knowledge, particularly the algebraical. I will here adduce no farther teſtimonies, as they may be found in the Preface to the Mathematical Method prefixed to my German Elements of Mathematics. And this has all along been my principal view, in applying myſelf with ſuch earneſtneſs to the ſtudy of the mathematics. Now, whatever of moſt ready and neceſſary uſe I remarked in the peruſal of mathematical writings, or gathered from repeated reflection on the powers of the human underſtanding, I inclined to bring into ſhort rules. And from my own experience, I can aſſure my readers, that theſe rules are ſtill extremely ſerviceable to myſelf, either when I paſs a judgment on any diſcovery, or want to inveſtigate any truth: and I doubt not, but others will find a like benefit. Yet I cannot omit ſuggeſting, that to the ready uſe of theſe rules, it will contribute much, if with care they peruſe my German Mathematical Elements; and, as they proceed, obſerve, how the rules are there applied. For as habit comes by exerciſe, exerciſe conſiſts in employing much reflection on truths that are duly proved.

To conclude, I muſt own, that when I firſt began to reflect on the powers of the human underſtanding, I found myſelf much

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at a loſs in many particulars, and, in ſome things, fell unneceſſarily into round-about ways, till the ingenious thoughts of Leibnitz, on the knowledge of truth, and on notions or ideas, in the Leipſic Acts of the year 1684, p. 573, afforded me a great and unexpected degree of light; ſo that I was ſurpriſed, that others, who had undertaken to write on the ſame ſubject ſince, had not taken any notice thereof. I heartily wiſh, that the ſtudious may receive ſuch benefit from this work, as I intended them. And when my wiſh is accompliſhed, I ſhall, with greater alacrity and earneſtneſs, exert myſelf in ſetting up a like light for them in the other parts of philoſophy.

Halle, October 18, 1712.

Advertiſement to the *Second Edition*.

I Have thought it not unuſeful, to add many more examples from every branch of ſcience, for the illuſtration of the rules. No one can be ignorant, that examples are not only of uſe for underſtanding, but alſo for applying the rules. And this has been particularly done in the firſt chapter concerning notions, as this is a capital matter, on which a great deal depends, and which is no where elſe ſo fully explained. And from this, I hope, every one will ſee, that my rules are general, and hold, not only in mathematics, but in every

every branch of ſolid knowledge. And as in the chapter of ſyllogiſms I ſhew, that in the buſineſs of inveſtigation we muſt make uſe of formal ſyllogiſms, if we would reflect orderly and proceed ſecurely; I have thought it not unſerviceable, to ſubjoin it immediately to the chapter on propoſitions, previous to both the chapters wherein I ſhew how to draw propoſitions either from experience, or *à poſteriori*, or from definitions and other previouſly known propoſitions, or *à priori*. In this manner I always premiſe whatever is to be of uſe in the following chapters. The firſt chapter on notions, and the fourth on ſyllogiſms, are two of the moſt important: for ſolid knowledge depends principally on diſtinct notions, and orderly-deduced demonſtrations. I perfectly well know, that ſome people reject both; deſpiſe what they cannot imitate: and they do well; their aim is reputation with the ignorant, and not ſolid knowledge.

Whoever will dexterouſly apply the rules concerning diſtinct notions and demonſtrations orderly carried on, muſt, as I have already often hinted, join the ſtudy of mathematics with logic; thus the uſe of the rules will become more ready: nor will he, like thoſe who uſe their five ſenſes more than their underſtanding, be all his life long toſſed amidſt perpetual fluctuations of opinions.

Halle, March 5, 1719.

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I Have thought it not unuſeful, to add many more examples from every branch of ſcience, for the illuſtration of the rules. No one can be ignorant, that examples are not only of uſe for underſtanding, but alſo for applying the rules. And this has been particularly done in the firſt chapter concerning notions, as this is a capital matter, on which a great deal depends, and which is no where elſe ſo fully explained. And from this, I hope, every one will ſee, that my rules are general, and hold, not only in mathematics, but in every

every branch of ſolid knowledge. And as in the chapter of ſyllogiſms I ſhew, that in the buſineſs of inveſtigation we muſt make uſe of formal ſyllogiſms, if we would reflect orderly and proceed ſecurely; I have thought it not unſerviceable, to ſubjoin it immediately to the chapter on propoſitions, previous to both the chapters wherein I ſhew how to draw propoſitions either from experience, or *à poſteriori*, or from definitions and other previouſly known propoſitions, or *à priori*. In this manner I always premiſe whatever is to be of uſe in the following chapters. The firſt chapter on notions, and the fourth on ſyllogiſms, are two of the moſt important: for ſolid knowledge depends principally on diſtinct notions, and orderly-deduced demonſtrations. I perfectly well know, that ſome people reject both; deſpiſe what they cannot imitate: and they do well; their aim is reputation with the ignorant, and not ſolid knowledge.

Whoever will dexterouſly apply the rules concerning diſtinct notions and demonſtrations orderly carried on, muſt, as I have already often hinted, join the ſtudy of mathematics with logic; thus the uſe of the rules will become more ready: nor will he, like thoſe who uſe their five ſenſes more than their underſtanding, be all his life long toſſed amidſt perpetual fluctuations of opinions.

Halle, March 5, 1719.

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Advertiſement to the *Third Edition.*

I Have always reckoned, that what this little book contains, is among the beſt things, I know: for I have repeatedly experienced, and do ſtill at this day experience, the utility of the rules given therein, in inveſtigating and judging of truth, even the mathematical. And I even venture to affirm, that on no other ſubject have I beſtowed more time, than on the principal matters which I here propound, and which are the foundation of all; and it was not without much unneceſſary circuition, and repeated reflection, I diſcovered and eſtabliſhed, that which I here offer to the public. But as to my particular, theſe weighty matters concerning the conduct of the underſtanding in the knowledge and ſearch of truth, employed my thoughts barely to the end that I might be enabled ſolidly and with certainty to diſcover the truth, and pave a ſmoother way for others in which they might tread without lett and circuition, and thereby arrive to uſeful knowledge; ſo with the ſame view, I publiſhed them, for others in like manner to enjoy the ſame benefit, I myſelf abundantly draw from them. It therefore gives me

no ſmall pleaſure to find, from the extraordinary ſale of this little book, and from the many accounts, which I have received from different hands, that others begin to ſee the utility of my rules, and to hold them in equal eſteem. But they will be enabled to uſe them with the ſame good ſucceſs, if they happen to have time and opportunity to exerciſe themſelves in mathematical demonſtrations; or, in caſe circumſtances will not admit of this, to examine, with care, my philoſophical works. And in order the more eaſily to effect this, I have, in this new edition, given ſome directions for that purpoſe. With this view, the fundamental rules are illuſtrated with a greater number of examples, in order, the better to underſtand them; and I have beſides, pointed out thoſe parts of my writings, wherein the matters, proper for illuſtration, are contained. And this was the only reaſon of my making a very few additions in this edition, without altering the number of paragraphs. And as at the very firſt I brought nothing into this book but what was of undoubted utility, and neceſſary to be at all times retained; ſo at this preſent, I find no reaſon to alter my opinion. For, though a great deal more might ſtill be introduced into it, not without utility, but not ſo indiſpenſa-

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bly neceſſary to every one *; it would thwart my preſent intention, and render the book unſerviceable to many. I, at preſent, content myſelf with what is abſolutely neceſſary, eſpecially as beſides, the buſineſs turns not on a multiplicity of rules, as on the repeated uſe of a few: practice muſt effect more than rules. Whoever knows rightly to uſe a few rules, may be able to find out more himſelf, when he has occaſion for them. He who ſtudies algebra, in the manner I uſually propound, will be convinced of the truth of what I ſay, and others will in time from their own experience; which I heartily wiſh, may be the caſe of every one, who has an ardent deſire for truth.

Halle, February 10, 1722.

Advertiſement to the *Fourth* and *Fifth Editions*.

AS in 1725 the fourth edition came out, the then circumſtances afforded me occaſion to touch on two points in chapter XIV. on which I had not thought in the preceding editions: namely, as from my own experience I had learned, that people

* This may be ſeen from my Latin work, publiſhed, 1728, under the title, *Philoſophia Rationalis, ſive Logica, Methodo Scientificâ pertractata*, in 4to.

people blended the indirect method of demonſtrating, or that *per abſurdum*, with the wretched manner of drawing conſequences; and as it is highly important not to confuſe both methods in the buſineſs of refutation, I pointed out diſtinctly the difference. And as I was no leſs aware, that ſome people blended apologetical with polemical writings, and would refer to the former what I intended for the latter in the ſaid chapter; I thought it alſo adviſeable to remove this miſtake; and therefore I have added, by way of concluſion, the manner in which perſecutors are to be treated.

In this fifth edition * I have endeavoured to render the book ſtill more uſeful, not only by inſerting a few, yet important, things up and down, but by adding the whole of chapter XVI. wherein I ſhew the manner of attaining a logical habit. Among the new inſertions may be alſo reckoned, that which I hint, chap. I. §. 48, concerning the difference between eſſentials and properties, as it contributes not a little to the rightly underſtanding definitions; and as I ſaw, that ſome, from the defect of this knowledge, found themſelves at a loſs, even in definitions duly framed. As to the reſt, every thing ſtands as in the ſeveral preceding

* In 1744, came out the twelfth edition, from which this tranſlation is made.

ing editions; for I have written nothing, but what at the firſt publication I found, on repeated experience, to be juſtly true: and the ſame, all others may experience, who chuſe to go by it in their ſtudies. And I earneſtly wiſh, that many more may have the ſame happy experience; and then at length, Underſtanding and Virtue will come to flouriſh among men, and I ſhall have fully reached the end, which I propoſe to myſelf in my manifold and extenſive labours.

Marpurg, April 5, 1727.

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THE AUTHOR's SHORT VIEW OF THE FOLLOWING LOGICAL TREATISE, TOGETHER WITH The Reaſons for his Manner of treating the Subject.

I Have undertaken to handle philoſophy in ſuch a manner, as ſhall be of moſt ervice to perſons in their ſeveral future tations and conditions in life; as I deem a highly pernicious opinion, that we earn it with no other view, than to have natter idly to talk about in company, to urniſh ſubjects of diſpute in the ſchools, and natter of wrangling and contention to the erverſe learned world. I have therefore, n this *treatiſe*, kept in *view* the ſame ſa- utary deſign, ſeparated the neceſſary and ſeful from the ſuperfluous and uſeleſs, and reated at large, on the utility, which a ew rules may be of, in a great variety of aſes.

Logic I divide into two principal parts, the theoretical, or that which contains the rules of logic, and the practical, or that which compriſes the manifold uſes of theſe rules. To the firſt part, belong the four firſt chapters: to the ſecond, the remaining chapters.

In the theoretical part, I handle the three operations of the underſtanding, as they are commonly called; viz. notions or ideas, judgments or propoſitions, and ſyllogiſms or ratiocinations: in the practical part, I ſhew the utility of this doctrine, in the inveſtigation of truth, both from experience, by means of a due uſe of the ſenſes, and from ratiocination, by means of the right uſe of the underſtanding: and moreover, its utility in the paſſing a judgment on truths, on books, in conviction, in refutation, and in diſputation.

The three operations of the underſtanding are the ground-work of the old Ariſtotelic logic, as handled by the ſchool-men, but which many of the moderns have rejected in their logical treatiſes: but as I never regard whether a thing be old or new, whether in eſteem or diſeſteem; ſo neither in this caſe: but reſt ſatisfied, if a thing is well-grounded. For the buſineſs of logic is to ſhew, how we may uſe the underſtanding in the knowledge and ſearch of truth: it explains diſtinctly, what-

hatever paſſes in the ſoul, whenever we
ome to the knowledge of a thing: and
herefore, not different from the natural
gic. It gives no other rules, than thoſe
hich nature herſelf preſcribes, only ex-
lains them more diſtinctly. Now, let any
ne conſider, wherein all our knowledge
nſiſts: either we barely repreſent objects
our mind, or we form a judgment about
em: and conſequently our knowledge
nſiſts either of notions or of judgments.
hen we form a judgment of a thing, we
ther appropriate thereto, whatever we
mediately obſerve therein, or conclude
om other judgments, whatever may agree
erewith. And juſt ſo we proceed in our
gations. And therefore, we have a two-
ld judgment; one, taken immediately
om the repreſentations of the objects;
e other drawn by ratiocination: the
rmer, I call intuitive judgments; the
tter, diſcurſive. To all this knowledge
nore we have not) we require three ope-
tions. We either barely repreſent an ob-
ct to ourſelves, without proceeding any
rther; or we form a judgment thereon,
ther from the notions themſelves, or by
eans of ſyllogiſm. And thus the whole
reducible to theſe three operations; viz.
repreſenting an object, judging of it,
reaſoning about it. And therefore, I
uld not poſſibly explain any more, than

theſe three operations of the underſtanding, to the end the artificial might not be made to differ from the natural logic. But as we cannot poſſibly judge of an object, without a repreſentation thereof, unleſs we would by rote repeat the judgment of another perſon, it is abſolutely neceſſary to treat firſt of ſimple repreſentation or apprehenſion, or of the doctrine of ideas or notions. And as theſe repreſentations are uſually expreſſed by names or terms, in order to be able to expreſs our mind concerning them; and as words or terms are abſolutely uſeful and neceſſary in forming judgments and ratiocinations; I have, directly after the notions, explained the uſe of terms, ſo far, as in the operations of the underſtanding, they ſtand for, or replace the notions. And laſtly, as in ratiocinations, judgments are preſuppoſed to be known, and to be readily formed, and as intuitive judgments ariſe from ſimple repreſentations; ſo I have, in the ſecond place, treated of judgments and propoſitions; and in the third, of ſyllogiſms or ratiocination.

Here in paſſing, I hint, once for all, my manner of aſſuming what another advances; namely, if I underſtand the meaning of his propoſition, I make as if I knew nothing at all of the matter, but were juſt then, for the firſt time, to inveſtigate the

truth in this point. I therefore begin to conſider, whatever is neceſſary for that purpoſe, and I take care to obſerve, whether the propoſition derives from any of the truths, or experiences, that I already know. If ſo, I admit it as true: if I find the contrary, yet this gives me an opportunity to inveſtigate the truth, though the other has come ſhort of it. And even in this caſe, I acknowledge him for my guide, and ſo far am I from vilifying him on account of his error, that I am rather inclined to juſtify him, as much as may be, and therefore more impartially to weigh, what ſhare of error he is chargeable with. And hereby I fail not to gain, that whatever I aſſume from others, is ſure to agree with my former ſentiments, without any apprehenſion of a contradiction. But hence too it happens, that I ſometimes aſſume the opinions of others but in part, and on this account alſo, never maintain or reject any propoſition, from the ſame reaſons that others do; I here frankly declare all the art I am maſter of, as ſome may receive benefit by it: for I have nothing more at heart, than that truth be received as ſuch, and applied to the common utility. And therefore, when I meet with any thing that furthers me in knowledge, I am quite impatient, till all, who have a real eſteem for truth, be made to ſee the

benefit thereof, and ſucceſsfully apply it to the common advantage. I am far from ſetting up to out-vie other people in any reſpect, rather rejoice, when out-vied by them; and both love and honour them, as they thereby afford me a freſh incentive to proceed with greater alacrity, in the taſk I have undertaken; and as I learn from them, what may ſerve to promote a farther progreſs in knowledge.

Leibnitz * has diſtinctly explained the difference there is between notions in general; a ſubject recommended by Deſcartes † as extremely uſeful in the knowledge of truth, and which, he and his followers unſucceſsfully attempted. Deſcartes proceeded no farther, than to clear and diſtinct ideas; Leibnitz added, adequate, which I afterwards found he had taken from the celebrated Dominican monk and ſubtle philoſopher, Valerianus Magnus. This diſtinction of notions I examined after my manner, and found it juſt. Only I thought it needful, farther to diſtinguiſh notions into compleat and incompleat, as not only of uſe in logic, but in the ſeveral branches of philoſophy, where there is the greateſt reaſon to ſettle the limits between diſtinct and confuſed knowledge. This laſt diſtinction, which I have added, is equally with the others founded in our notions; in regard,

* Act. Erudit. Ann. 1684. p. 537.
† De Methodo.

regard, all diſtinct ideas are not altogether ſuch, but ſome in part only diſtinct, and in part confuſed.

Our repreſentations are either of ſingular or individual things, or of univerſal. Individuals are no objects of ſcience, but general or univerſal notions are, to the end we may be enabled to form general judgments or propoſitions, which may be of uſe in ratiocinations or ſyllogiſms.

The diſtinction, uſed in the common logic, of individual, genus and ſpecies, I have retained, as of uſe in propoſitions and ſyllogiſms, but have explained them more fully, as I ſhew the reaſon of this diſtinction, and therefrom derive diſtinct notions of individual, genus and ſpecies; and it were to be wiſhed, that men always framed their judments by genus and ſpecies; the reaſon of which appears in ſyllogiſms, by which diſcurſive judgments are deduced.

Now, to the end that both the general diſtinction of notions, and their diviſion into genus and ſpecies might be made uſeful, I have added ſeveral problems, of which, I have given the ſolutions from definitions, with the help of experience. For, as in the ſciences, all depends on diſtinct and compleat notions, as may be ſeen from the doctrine of judgments and ſyllogiſms; ſo I have alſo ſhewn, in what manner, from the repreſentations of individuals, to form diſtinct notions, and thoſe ge-

neral, from the genus and ſpecies to which they belong; and from what cauſe, on the contrary, notions remain confuſed, and why again diſtinct notions may degenerate and become debaſed; and how far it is in our power to obviate this.

And as it is matter of no leſs importance, that we accurately diſtinguiſh the notions of genus and ſpecies, I have alſo ſhewn, how, from the notion of a ſpecies, to find that of a genus; and again, from the notion of a genus, that of a ſpecies; and from the notion of one ſpecies that of another. For I have found, that neither the doctrine of Deſcartes, concerning clear and diſtinct notions, nor that of Leibnitz, and my improvement thereof, nor the ſcholaſtic doctrine of individual, genus and ſpecies, though cleared of its obſcurity, can be with any advantage uſed, unleſs the problems adduced, can firſt be reſolved; the which I have undertaken to do, in order to extend the limits of logic.

Now, though Ariſtotle wanted to bring the genus and ſpecies of things into ſome order, in what he calls the *Categories*, which would have been of conſiderable uſe, not only in framing definitions, but alſo judgments, had he ſucceeded in what he undertook; yet I have mentioned nothing in my logic about it, in regard, that what the common logic adduces concern-

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ing the categories or predicaments, is far from being ſufficient for ſo important a purpoſe, as that for which the genus and ſpecies have been attempted to be claſſed. And therefore, as I adduce nothing but what may be of indiſpenſable uſe, both in the ſciences and in common life, and abſolutely neceſſary for thoſe who want to know the truth, and apply it to the uſe of man, I have, as I think, had ſufficient reaſon to omit it.

All this I advance, to the end, we may learn how, with benefit, to employ the diſcoveries of others, and go on to build on the foundation they have laid: for this is the way to promote the ſciences. It is not to be ſuppoſed, that when a man writes a ſyſtem, every thing muſt be of his own growth or invention; as this would be to give out, that our predeceſſors had done nothing at all to the purpoſe. The inventions, which give the firſt riſe to ſcience, are but mean and inconſiderable: for as all truths are derived from others previouſly known, ſo the primary or original inventions muſt have ariſen from common or vulgar notions, and therefore cannot go very deep. Should any one, therefore, who writes on a ſcience, advance nothing but what was his own diſcovery, he would at beſt, only give us the firſt principles of a ſcience, or even pleaſing fairy dreams, that have no manner of reality, whenever

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he happens to miſs the true road; and ſometimes, only common and well-known things, ſet off with uncommon and extraordinary phraſeology. Whereas, if he happens to advance far, and to adduce any thing that is uſeful, he certainly muſt have taken the benefit of that light, which others held out to him. It is, however, certain, that if a perſon examines matters, in the manner I uſually do, the reſult will be the ſame, as if he had been the firſt inventor; for he has, in effect, drawn the whole from previous knowledge, juſt in the manner he would have done, if he were to make the diſcovery.

From what has been hitherto ſaid, we may learn, how it is poſſible to cull from different authors, whatever is valuable in them, and yet the whole be properly connected. Whence, thoſe are under a miſtake, who imagine, that a connection is needleſs, as they aſſume the title of *Eclectics*, that is, adopt whatever appears to them the moſt probable in every writer. And therefore, Deſcartes had done better, if he had retained of the old philoſophy, whatever was valuable therein, as in fact, he has given occaſion to variety of prejudices, which, in one or other reſpect, have much retarded the progreſs of knowledge; though it cannot be denied, but that our obligations to him are great.

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In the ſciences, our aim is to procure general knowledge; for which we lay a foundation by means of definitions: and to this tends all I have ſaid concerning diſtinct, compleat and adequate notions. For diſtinct and compleat notions yield us definitions, and adequate give them mutual connexion; and nothing farther is neceſſary. And therefore, in the firſt chapter, I have treated of notions and definitions. Tſchirnhauſen, in his *Medicina Mentis*, greatly commends real definitions, and prefers them to the nominal. But on a more mature reflection, I have found, that in the ſciences, we may ſucceed well enough with nominal, and even draw from them real definitions. It is however not to be denied, that with real definitions we make an eaſier progreſs, than with bare nominal. Tſchirnhauſen exerts himſelf moſt, in what manner to inveſtigate real definitions. But all that he ſays, are rules, which he has borrowed from the real definitions in geometry, of which Barrow, in his *Lectiones Geometricæ*, has given a variety of examples, and from which Tſchirnhauſen took the hint. Now though, after the peruſal of Barrow, I came better to underſtand what Tſchirnhauſen wrote, concerning the inveſtigation of real definitions, yet I ſoon found, that according to the rules which he had laid down, real definitions could

could not well be inveſtigated out of the limits of geometry. And on farther reflection, and after diſtinguiſhing the different caſes, in which real definitions are inveſtigated, I ſhewed in my lectures on Tſchirnhauſen's book, in what manner we attain to real definitions.

Now, as we endeavour to procure diſtinct notions of objects, to the end we may be enabled to form general definitions, and from theſe, intuitive judgments, as in which, the foundation of all ſolid knowledge in the ſciences is laid; ſo it is neceſſary to allot peculiar names to every thing we diſtinguiſh in our notions, and by theſe to form repreſentations of them. For our general knowledge is entirely ſymbolical, in order to its diſtinctneſs. And from this view, I have alſo treated of the uſe of words, and particularly ſhewn, how we may intelligibly expreſs our mind, and how to be on our guard, not to blend empty ſounds with things; together with the manner, how the ordinary meaning of a word is diſcoverable. Whence we may again ſee, that I make it my buſineſs to propoſe whatever I think may conduce to the gaining a degree of ſolid knowledge. And thus, I imagine, I have explained the firſt operation of the underſtanding in a practical manner; ſo that nothing is adduced, which has not its determinate uſe,

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and nothing omitted, which is neceſſary to be known by him, who wants to get a ſure and firm footing in the knowledge of truth; ſo he be careful to place himſelf in ſuch a ſtation in life, as that therein his knowledge may be uſefully applied.

In explaining the ſecond operation of the underſtanding, namely, the judgment, I have adduced no other diſtinctions thereof, than what are neceſſary to be underſtood in the future uſe of logic, and in the third operation of the underſtanding. For I was unwilling to propound, what a man afterwards readily forgets; nor did I want, a perſon ſhould learn philoſophy, with a view to humour the vicious taſte of the ſchools for idle diſputation and wrangling; but in order to uſefulneſs in future life, and in what are called the higher faculties. And therefore I have contented myſelf, with what is abſolutely neceſſary for this purpoſe. I have, however, endeavoured to ſupply, whatever is deficient in the common logic. I have given a genuine notion of judgment, from the nature of the ſoul, and therefrom ſhewn the ground or reaſon of every thing I teach: which is not only of uſe, in order to know, that whatever is taught concerning judgments is ſtrictly true, and agreeable to philoſophical knowledge, which is to ſhew, why a thing is rather thus, than otherwiſe; but alſo farther

ther ſerves, to render us qualified to draw intuitive judgments from experience; and when, in demonſtrations, we are to draw one from many other propoſitions, deduced by means of independent or detached ſyllogiſms, to be able to proceed in demonſtrating, and to connect the preceding with the following ſyllogiſms.

Generally, in logic, the diſtinction of propoſitions is omitted, but carefully attended to in mathematics; where propoſitions are diſtinguiſhed into axioms and theorems, poſtulates and problems. This diſtinction I have thought neceſſary to explain, as being extremely uſeful in the genuine practice of logic, as a great part thereof is ſolely founded on this diſtinction. And laſtly, as Tſchirnhauſen lays great ſtreſs on the diſtinction of being able to conceive or not conceive a propoſition, or of not knowing, whether it is conceivable or no, and many miſuſing or miſapplying all this, as he makes it the criterion of truth, of error, and of whatever is unknown or undiſcovered; I have thought it the more needful to give a diſtinct notion thereof, as what Tſchirnhauſen has omitted to do. For without diſtinct notions, it is impoſſible to obviate miſuſe or miſapplication.

Whatever is taught in the common logic, which is in ſo much diſrepute with many, con-

concerning ſyllogiſm, I have found to be juſt and true in every reſpect. But here again, I have propounded the ſubject in my manner, ſo as it might have been, by cloſe reflection, deduced by the inventors; in order, not only to perceive its truth, but at the ſame time to ſhew, that this is the practice or common manner uſed in reflection; which was here ſo much the more needful, as in the ſcholaſtic philoſophy we have no other inſtance, where every thing has been inveſtigated with ſuch ripeneſs of reflection, as what we find they have employed in the third operation of the underſtanding. And hence we may learn, how the beſt things may be held in contempt, doomed to reproach and reprobation by people, who are not in a condition to judge of the nature thereof; and yet this not always from inability, but as they give themſelves no time duly to conſider the matter. Whoever conſiderately peruſes that which I have advanced on the ſubject, will find a pattern, in what manner we are to proceed in a courſe of accurate reflection, and to advance from one thing to another: and what he here learns, will be greatly ſerviceable in duly analyſing mathematical demonſtrations, and thereby acquiring an ability or habit of demonſtration. But as at this day great prejudice is entertained againſt this doctrine, which I myſelf had alſo

alſo entertained in my early years, being then incapable of the reflection neceſſary to a ſolid inſight into the nature of the ſubject; I have alſo made it my buſineſs to remove the ſame, and therefore circumſtantially ſhewn their uſe in mathematical demonſtrations, in the invention even of mathematical truths, in framing ſolid demonſtrations, out of the province of mathematics, in the mathematical manner, and in the refutation of errors: from which we not only learn the genuine nature of demonſtration, but alſo obtain a pattern, by which to exerciſe ourſelves in the other ſciences.

But as the ſyllogiſms of the ſecond and third figures, are therefore only admitted as genuine, becauſe reducible to the firſt; and as this reduction in general cannot be ſhewn without much circuition, as may be ſufficiently ſeen from the ſchool-philoſophy; and on the other hand, as the particular inſtances in theſe figures may, without any trouble, be reduced by any novice, to the firſt figure; I abide by the firſt figure only, and in general, only mention ſo much concerning the others, as is neceſſary for diſtinguiſhing their ſyllogiſms. And this I have the rather done, as the ſyllogiſms in the firſt figure are ſufficient to all intents and purpoſes, and the other figures eaſily reducible thereto. Beſides,

were

were we to ſhew, by the reduction of the ſyllogiſms of the ſecond and third figures to the firſt, from general principles, that they are equivalent to thoſe in the firſt figure, and conſequently juſt, there would remain much to be explained, which would be difficult for beginners to learn, and yet afterwards be of no manner of uſe to them: and therefore, I have omitted all that is otherwiſe taught, with reſpect to this reduction. And let me only add, that in particular, by this third operation of the underſtanding it may be ſeen, that what I have already ſaid is true; namely, that the natural logic differs not from the artificial, and that this laſt is barely a diſtinct explication of the firſt.

After having juſtified the rules, which I have advanced on the three operations of the underſtanding, I might there reſt the matter; but the love to truth, and the deſire thence ariſing, of eſtabliſhing certainty, and removing all poſſible ſcruples, have prevailed on me to bring matters to the teſt, to the end I might be convinced from experience of the juſtneſs of theſe rules, and have a full aſſurance, that I attained to the genuine logic. And this I mention here, that others alſo may examine my logic by the ſame teſt, or be enabled to ſee, whether the logics recommended

mended by others, will ſtand the trial or not. I myſelf have experienced the power of prejudice with reſpect to logic, in the caſe of aiming at certainty, and ſeeing things with our own eyes. And in the firſt place, I have analyſed mathematical demonſtrations, and found, I never had any inſtance, the ground or reaſon of which I could not aſſign from my logic. And hereby I diſcovered, that my logical rules are, that which a regular and compleat demonſtration is in mathematics, particularly in geometry: and thus I have been convinced, that they are a juſt ſample of the mathematical method. As to a ſecond teſt or trial, I have conſidered, in what manner we regularly proceed to common or vulgar knowledge, and paſs on from one thought or notion to another: and I have with pleaſure obſerved, that the natural way of thinking is the very ſame with that, which I diſtinctly deſcribe in my logic; and of which, I firſt made mention in my Mathematical Lexicon, under the article, *Demonſtration*. From which I learned two things; (1) That the artificial logic differs not from the natural, but rather is a diſtinct explanation thereof, as has been already mentioned. (2) That when we conſider the demonſtrations in mathematics, we ſtill proceed in the natu-

ral manner of thinking. Whence I farther came to know the reaſon, why mathematical demonſtrations are ſo convincing; and why, by a diligent and repeated conſideration of them, we extend the powers of the underſtanding. And thence alſo it was very evident to me, that we have the leſs reaſon to doubt, whether the mathematical method is applicable to other ſubjects, as it is the natural manner of thinking. I in like manner recommend this teſt to others, in order to be convinced, how far a logic is good for any thing. Laſtly, I proceeded to a third trial, and, both in mathematics and in other ſciences, conſidered every thing in ſuch a manner, as it was, or might at leaſt have been, inveſtigated by the inventors; in regard it is well known, that one and the ſame truth may be inveſtigated different ways: and here I found, that my logic reached that end, in ſo far as logic is admiſſible on ſuch occaſions. But, indeed, I came to ſee, that the application of logic is not alone ſufficient for invention, but that, beſides, we require other rules, of which I have made ſome mention in my metaphyſics. I ſtill continued to repeat thoſe trials, and therefore, have not, from a prejudice of precipitation, taken up or entertained a groundleſs confidence in my logic.

As we learn logic, barely with the view of making a happier progreſs in the knowledge of truth, and of more eaſily avoiding error, I have not contented myſelf to reduce the theory thereof to practice, and to advance nothing but what is indiſpenſably neceſſary for this end; but I have alſo treated at large of the utility of logic, on all the occaſions that can poſſibly offer to a perſon of learning. On the application of logic I have been more copious, than on the theory. And yet, in the praxis, I aſſume no other rules, than thoſe eſtabliſhed in the theory; and indeed, I had no occaſion to do otherwiſe, as I found them ſufficient in ſo many different and extenſive trials. And thus alſo, my logical rules hang all of them perfectly well together: and as I only diſtinctly explain the natural method, they alſo appear natural to every one, who reads them with attention and without prejudice; for he finds, that every thing paſſes in his mind, in the manner I deſcribe. This application of logic has hitherto been entirely omitted: and therefore, as the theory has not been at the ſame time propounded in a practical manner, and as there was alſo a want of diſtinct notions; it is no wonder, that many have not been ſenſible of, and that ſome have abſolutely denied, the utility of logic: but from the coincidence

incidence of natural and artificial, I entirely take off that objection. And that I have alſo conſidered every neceſſary caſe, in which a perſon of learning may have uſe for logic, may be eaſily ſhewn: for either he wants to find out the truth, or to inculcate it on others. Whoever attempts to diſcover truth, wants to learn it either from other people, or to inveſtigate it by his own reflection. He who inclines to learn it from others, does ſo, either by verbal inſtruction, or by reading; and thus muſt know in what manner to reflect on, and examine that which he hears, and paſs a judgment on the books which he reads. Whoever would, by his own application, find out the truth, muſt do it, either by means of experience, in the due uſe of his ſenſes, or by means of reaſoning, in the right uſe of his underſtanding; and thus he muſt underſtand, in what manner to proceed, as well in experience, as when he attempts to draw one truth from another, by his own reflection and meditation. Whoever would inculcate truth on another, wants either to convince him of the truth, or to refute his errors, or to diſpute with him on controverted points. Now, as I have ſhewn, in what manner to apply logic, when we want to find out the truth, both by experience and by our own reflection,

tion; and to paſs a judgment on the truths diſcovered by others, and on their writings; and to convince or refute others, or to diſpute with them; I imagine, that I have omitted none of the occaſions, on which a man of learning may require the uſe or application of logic.

Many years ſince, I gave a method of demonſtrating the truth of the Chriſtian Religion *, much approved of by the Abbot *Molanus* of *Loccum*, who encouraged me to put that method in execution. But I ſuggeſted, that this undertaking preſuppoſed a great many things, which muſt be previouſly made out: to which head I reckoned, the demonſtrative method of explaining the ſcriptures, a natural theology, and a moral philoſophy, ſcientifically or demonſtratively executed. And on theſe, I firſt applied my thoughts, to the end that, in ſo weighty a matter, nothing might be precipitated or raſhly undertaken. And this gave me occaſion of ſhewing alſo the uſe of logic, in the interpretation of ſcripture. And I ſoon obſerved, that the rules, there given, were of good ſervice, when in Aſtronomy, I came to reſolve the queſtion; namely, whether the motion of the earth about its axis and round the Sun, is contrary,

* Act. Erudit. Ann. 1707. p. 167.

contrary, or not, to ſcripture: for I found, that we can avoid the uſual anſwer given by the Copernicans, viz. as though the ſcripture accommodated itſelf to the notions of the vulgar; an anſwer I could never reliſh. Other uſes I ſhall at preſent omit, only hinting thus much, that a perſon acts contrary to the reverence due to the word of God, when he foiſts into ſcripture his philoſophical thoughts, and often his errors, and gives them out for divine truths. For, when afterwards it comes out, that a perſon has entertained errors concerning natural things, this cauſes no ſmall degree of ſcandal and offence to many, to find that theſe errors are maintained with as much zeal and warmth, as doctrines clearly expreſſed in ſcripture. And therefore it gives me a great deal of pain, when people, whoſe buſineſs it is to interpret ſcripture, and to ſearch out the meaning of the Spirit of God in his word, carry themſelves in an unſeemly manner, in paſſing judgments on philoſophical hypotheſes, and miſapplying the ſcripture to their own preſumed advantage. But now, as the uſe of logic in interpreting ſcripture is alſo of ſervice to philoſophers, in order to defend themſelves againſt the attacks of thoſe, who would very inconſiderately urge and miſapply the ſcripture,

and

and conſequently, the authority of God; I have alſo in this view thought it neceſſary, not to omit this uſe. And thus I imagine, it is at length evident, that I have ſufficiently provided for all the uſes and applications of logic.

PRELI-

PRELIMINARY DISCOURSE

CONCERNING

PHILOSOPHY.

PHILOSOPHY is the Science of all poſſible things, together with the manner and reaſon of their poſſibility. Philoſophy, what.

II. By SCIENCE, I underſtand, that habit of the underſtanding, whereby, in a manner not to be refuted, we eſtabliſh our aſſertions on irrefragable grounds or principles. What grounds are irrefragable, and what manner is irrefutable, will appear in the courſe of the following treatiſe. Science, what.

III. I call Poſſible, whatever thing can be, or whatever implies no contradiction, whether actually exiſting or not. Poſſible, what.

A reaſon for every thing.

IV. As of nothing we can form no conception, ſo neither of the actual exiſtence of any thing, without a ſufficient ground or Reaſon; which ſhews, why it rather is than is not; as will appear in its proper place (Metaphyſics, § 30, 31.) For the preſent let it ſuffice, that the aſſertion is grounded on experience.

Knowledge of a philoſopher.

V. A Philoſopher therefore ought, not only to know the poſſibility of a thing, but alſo aſſign the reaſon of that poſſibility. (§ 1, 2.) It is not enough, that he knows, for inſtance, the poſſibility of rain, he muſt alſo aſſign the manner and reaſon of its poſſibility.

How diſtinguiſhed from the common.

VI. And hereby the Common or Vulgar Knowledge is diſtinguiſhed from the philoſophical. Though a perſon, unacquainted with philoſophy, may learn much of what is poſſible from experience, yet he is incapable of aſſigning the reaſons of poſſibility. From experience, for inſtance, he may learn the poſſibility of rain, without being able to ſhew the manner, or aſſign the reaſon of that poſſibility.

Utility of philoſophical knowledge.

VII. We might therefore be apt to think, that the common or vulgar knowledge is abundantly ſufficient for the purpoſes of life. But as things happen to ſucceed or anſwer under certain circumſtances only, the common knowledge may oftentimes overlook a circumſtance, and

and then aſſign, as general, what anſwers only in a particular caſe. Thus, for inſtance, we obſerve that Compaſſion is ſhewn to the miſerable, when their miſery is made known; and hence we imagine it to be a general truth, that to excite compaſſion, there needs only a repreſentation of miſery. We, in like manner, obſerve, that roſemary is propagated by ſlips ſtuck in the earth, but we would find ourſelves greatly diſappointed, did we treat all ſlips of plants, of a cloſe texture, in the ſame manner. A philoſopher, on the contrary, needs never apprehend a miſapplication of any one propoſition, as he knows the reaſon why, and time when, a thing ſhall anſwer, and never diſappoint his expectation (§ 6.). As, that the repreſentation of miſery then only excites compaſſion, when the mind is previouſly diſpoſed to take a pleaſure in the happineſs of another: And that a ſlip will ſtrike root when a knot or joint comes to be covered in the earth, if the ſlip does not readily wither, and if the rind is with eaſe penetrated by the ſtriking roots. Such a one is capable alſo of deducing unknown truths from thoſe already known, and of deriving from his knowledge a pleaſure ſo delicious, as no other can poſſibly come up to.

Objection to the definition of philoſophy.

VIII. Some may wonder, that we ſhould extend the notion of Philoſophy to all poſſible things, as the wiſeſt muſt own his ſhare of knowledge to be but ſcanty, and therefore might think a leſs preſumptuous and more modeſt definition more adviſeable.

Anſwered.

IX. I would anſwer, that it is abſolutely more adviſeable to frame a definition of Philoſophy from its higheſt poſſible degree of perfection, rather than from the degree or ſtandard of any man's knowledge of it. As, in this manner, no unneceſſary limits will be put to knowledge, which might reſtrain the mind in exerting its reflective powers, and conſequently withhold important diſcoveries from the world; as was the caſe when it was thought, that Ariſtotle had reached the utmoſt boundaries of human underſtanding. But every one will rather be excited to make ſtill greater progreſs, as he is fully ſenſible much remains ſtill to be diſcovered; of which our own age, in the caſe of Mathematics, is an evident proof. It will alſo teach us humility, not to overrate our preſumed attainments, when we find the utmoſt extent of what we already know, to be but the leaſt part of what remains ſtill unknown. And, in general, it is well known, that things ſuſceptible of degrees are always defined in the general, without

without reſtraint to any particular degree. For inſtance, every man is not temperate in the ſame degree. In order to define temperance therefore we are not to confine ourſelves to this or the other degree thereof, in this or the other perſon, but, in order to obviate every exception, we extend it to its utmoſt poſſible pitch.

X. An attention to ourſelves ſhews, we have a faculty, uſually called the Underſtanding, of perceiving poſſible things. But, how far this faculty extends, and in what manner we are to uſe it, either in the diſcovery of truth by our own reflection, or in paſſing a rational judgment on the diſcoveries of others, is not generally ſo evident. And therefore, in order to know, whether our abilities are fitted for philoſophical enquiries, it ought to be our firſt care, to learn what are the powers of the human underſtanding, together with their right uſe and application in the knowledge and ſearch of truth: and that branch of philoſophy, which teaches this, is called Logic. First part of philoſophy.

XI. Among poſſible things, we muſt admit of one neceſſary, ſelf-exiſtent Being; otherwiſe ſomething would be poſſible, of which no ſufficient reaſon could be aſſigned, contrary to what was eſtabliſhed above, (§ 4.) This ſelf-exiſtent Being we call God. Other things, which have the rea- Second part.

ſon of their exiſtence in the ſelf-exiſtent Being, we call Creatures. Now, as the buſineſs of philoſophy is to aſſign the reaſon of the poſſibility of all things, (§ 5.) the doctrine concerning GOD claims preferably an inquiry, previous to that of the Creatures; an accurate knowledge of which laſt is to be reduced into, or rather deduced from, their firſt principles. Though indeed we readily admit we muſt have a previous common or vulgar knowledge of them, but which we have no occaſion to draw from philoſophy, as from our early years we have it from experience, (§ 6.) That branch, therefore, of philoſophy, which treats concerning GOD, and the origin of the Creature, is called Natural Theology.

Third part.

XII. The Creatures manifeſt their activity, either by motion, or by thought: The former, we call bodies, the latter, ſpiritual beings. Now, as philoſophy attempts to aſſign juſt reaſons for every thing, its province muſt be, to inquire into the powers and effects, both of the things which act by motion, and of the others, which are ſelf-conſcious, by thought. And thus philoſophy ſhews, whatever is poſſible in the world by the powers, as well of bodies, as of ſpiritual beings. This laſt we call Pneumatology; and the other, Phyſics, or Natural Philoſophy.

XIII.

XIII. That thing within us, which is capable of thought, we call the Soul. Now, as the ſoul is a ſpiritual being (§ 12.) and, beſides the faculty of Underſtanding, has alſo that of Will, on which a great deal, in this world, depends; we are alſo to ſhew all that is poſſible by the will: And to this head belong the Law of Nature, Ethics, Politics, &c. Fourth part.

XIV. As all things, whether bodies or ſpiritual beings, in ſome things agree, and in ſome others diſagree or differ; their general agreements, and general diſagreements or differences, compriſing the general knowledge of things, conſtitute that branch, which we call Ontology; which laſt, together with pneumatology and natural theology, forms Metaphyſics. Fifth part.

XV. We either proceed no farther in our knowledge than the powers, which produce effects in nature, or we advance one ſtep farther ſtill, namely, in accurately-meaſuring the quantity, both of the powers, and of the effects, in order to ſhew, that certain powers may produce certain effects. For inſtance, either we reſt ſatisfied with knowing, that the air, violently compreſſed, can force water to a conſiderable height in a fountain, or we attempt accurately to diſcover the degree of force imparted to the air, when compreſſed to the half, the third, the fourth, Origin of Mathematics.

&c. part of its former ſpace, and how many feet high it forces the water in each caſe. This laſt degree of knowledge requires the meaſuring of things, that have quantity. With this view Mathematics were invented. On the different parts of which I have treated in my "German elements of mathematics," and in the abridgment made therefrom.

Their utility. XVI. And thus mathematics lead us to the moſt accurate and perfect knowledge poſſible to be attained.

Deſign of this work. XVII. Now, as it is not every one's intention to proceed ſo far in philoſophical knowledge, we incline not in theſe elements to intermeddle with that higher degree thereof, fully ſatisfied to have attained to a juſt knowledge of the powers of nature, and to be thence able to form a judgment of their poſſible effects.

RA-

RATIONAL THOUGHTS ON THE POWERS OF THE HUMAN UNDERSTANDING, &c.

CHAP. I.

Concerning NOTIONS or IDEAS.

I. WE obſerve in ourſelves, that we feel, or perceive by ſenſe, a variety of objects: But we are ſaid to feel or perceive, when conſcious of any thing as preſent to us; thus we feel pain, ſound, light, and perceive our own thoughts. Senſation, what.

II. That operation, or act of the ſoul, by which we are conſcious to ourſelves, I call a THOUGHT: For we commonly ſay, we think of nothing, when we imagine we Thought, what.

we are conſcious of nothing: And thus ſenſations are thoughts of things preſent to us. We here only explain words or terms, in order to ſhew in what ſenſe we take them. The things denoted by them, are explained at large in the Metaphyſics.

Senſe, what.

III. The faculty of immediately feeling or perceiving external things, is called SENSE, which is uſually reckoned five-fold, as ſeeing, hearing, feeling, ſmelling, taſting.

Notion, what.

IV. A NOTION or IDEA, I call a repreſentation of a thing or object in the thought or mind. For inſtance, I have a notion of the Sun, when able to repreſent it in my thought, either by an image, as if preſent to my eyes, or barely by words, by which I give to underſtand, what I have obſerved concerning the Sun, that he is that luminous body in the heavens by day, which dazzles the eyes, and makes the earth warm and bright; or by ſome other ſigns, ſuch as ☉, the ſign uſed in Aſtronomy. In the ſame manner I have a notion of Nuptials, when I can repreſent either in my thoughts, as in a picture, the manner, in which two perſons, who have made a mutual promiſe of marriage, perform their promiſe, according to the uſual cuſtom of the country; or by words alone, or other ſigns, among which we may reckon

reckon pictures, I inform myſelf, or others, that nuptials are a ſolemn execution of a mutual promiſe. I have farther a notion of Good, if I know, that good is that which renders my nature and my external ſtate more perfect. Again, I have a notion of GOD, when I reflect, that he is that being who contains, in himſelf, the reaſon of the actual exiſtence of the world: I have alſo a notion of a Minor, when I repreſent to myſelf a perſon, who, on account of his age, is incapable of providing for, or governing himſelf.

Notions how attained by ſenſe.

V. Now, as the ſenſes give occaſion to thoughts or repreſentations of the things without us, (§ 2, 3.) they thus lead us to the notions of them. Thus, by Sight, we obtain a notion of light and colours; by Hearing, of ſound; by Feeling, of things ſoft and hard; by Smelling, of ſcents agreeable or diſagreeable; by Taſting, of ſweet and ſour.

The manner not explained here, and why.

VI. But whether our notions of external things are conveyed into the ſoul, as into an empty receptacle, or whether rather they lie not buried, as it were, in the eſſence of the ſoul, and are brought forth barely by her own power, on occaſion of the changes produced in our bodies by external objects, is a queſtion, at preſent, foreign to this place. In my "Thoughts "on GOD and the Human Soul, Chap. V." I ſhall

I ſhall then only be able to ſhew, that the laſt opinion is the more agreeable to truth. Beſides, the deciſion of this point is not neceſſary to our preſent undertaking: For we can have notions of external objects, and from theſe form juſt judgments of them, though ignorant whence they derive: Juſt as we can uſe the hand, though ignorant of its internal ſtructure, nor able to explain its various motions.

Our duty.

VII. Here it is ſufficient, that we diligently attend to the thoughts, to which our ſenſes give occaſion. And this we do, when we carefully diſtinguiſh the objects that differ; and, as much as may be, obſerve what it is that makes us judge the one to differ from the other. For inſtance; I ſee, at the ſame time, two figures, a Triangle and a Square; the triangle exhibits a quite different repreſentation from the ſquare. Now, if I aſk myſelf, why I pronounce the triangle to differ from the ſquare; I ſhall find, that the reaſon is, becauſe the triangle is contained under three, but the ſquare under four lines; that which I find in the triangle, I find not in the ſquare; and what I obſerve in the ſquare, agrees not with that which I find in the triangle; we can never be ſo far miſled as to take the one for the other. And hereby we come to obſerve the difference of both figures. So, if I aſk myſelf,

ſelf, why I ſay it is light; I find the reaſon is, becauſe I can ſee the objects around me. Therefore Light is that, which renders ſurrounding objects viſible. In like manner we find, that Buying is the making the property of another our own, upon a valuable conſideration: That a perſon is Plethoric, who has more blood than is neceſſary to health: That a Tumor is an extraordinary thickneſs in the fleſhy parts of the body, &c.

When difficult to procure a notion.

VIII. It is an eaſy matter, by the ſenſes, to come to a notion of a thing, when they exhibit to us every thing, whereby it is diſtinguiſhed from every other object; and in ſuch a manner, as either not to blend, at the ſame time, things that are foreign to it; and here the above inſtance of the triangle and ſquare is applicable: Or that what is peculiar to the object, ſhall ſtrike the ſenſes more than that which is foreign thereto; to which head we may reckon the inſtance of light: But if the contrary takes place, it is a difficult matter to procure a juſt notion; either we take the falſe for the true, or leave out ſomething, or take into it what is foreign thereto. For inſtance; I have ſeen, or heard, how Titius has broke into a merchant's ſhop, and taken goods thence. In this, it is true, the notion of a Thief is contained, but what is peculiar to it lies ſo concealed among

among foreign things, that one may eaſily miſtake in diſengaging it therefrom. For the merchant, his ſhop, and his wares, as alſo the breaking into the ſhop, have no place in the general notion of a thief; ſo that it is not every one, ſeeing or hearing what Titius has done, that can repreſent to himſelf a thief, as one, who takes the property of another againſt his will, and without his knowledge, though every particular in this inſtance happened, as we have repreſented it. But, in ſuch a caſe, the labour is greatly facilitated, if we compare ſeveral particular inſtances together, as thereby we come to ſee, what they have in common, and what circumſtances muſt be omitted, in order to reſerve what is peculiar to the notion we want: For inſtance; if to the foregoing example of theft I farther add, that Sempronius got over a garden-wall, and plucked the fruit of a citron-tree, which he carried away: I find it eaſier from this, than from the foregoing inſtance, to determine, that a thief is a perſon, that takes the property of another againſt his will, and without his knowledge: For Titius and Sempronius agree no farther, than in taking and appropriating to themſelves the goods of an owner, againſt his will, and without his knowledge. We, every day, obſerve, that we, and other perſons, are

objects of love: But, it is not every one that underſtands, that love is a diſpoſition of the mind to derive a pleaſure from the happineſs of another, though to be found in every inſtance, that can be alledged of love. Time (Metaph. §. 94.) affords more inſtances; alſo ſpace (Metaph. § 46.); place (Met. § 47.); continuity (Met. § 58.), &c. To this head alſo we may add conſcience (Moral. § 73.); ſcruples of conſcience (Moral. § 76.); lively knowledge (Moral. § 169.), &c. But it will greatly facilitate our meditation, if we write down both examples, in ſuch a manner, that the particulars that differ, be put in one line apart; for ſo we may the more eaſily compare the particulars that mutually agree, and are in both the ſame.

Notion clear and obſcure what.

IX. If the Notion, which we have, is ſufficient to diſtinguiſh by it the object to which it belongs; as when we know it is the very object which goes under this or the other name, and which we have ſeen in this, or the other place, it is ſaid to be Clear: On the contrary Obſcure, when inſufficient to diſtinguiſh by it the object again. Thus we have a clear idea of colours, as we can know them again, and diſtinguiſh them from each other when they happen to offer to us. In like manner we have a clear idea of Anger, as we can diſtinguiſh when a perſon is in a paſſion.

ſion. We have a clear idea of a Conſumption, as on ſight we can tell a perſon is conſumptive. But if, in a garden, we ſee an exotic or foreign plant, and cannot juſtly recollect, whether it is the ſame we have ſeen in another place, or have heard called by a certain name; we can have but an obſcure notion of this laſt. So, many perſons have but obſcure notions of the technical terms, which are uſed in mathematics and philoſophy.

Degrees of obſcurity.

X. But this obſcurity admits of ſeveral degrees: For, ſometimes we can recollect, in the object before us, ſeveral characters or marks, which we alſo obſerved in a thing we have elſewhere ſeen; and ſometimes but few. For inſtance, on viewing the foreign plant, we recollect, that another, of which we have an obſcure notion, had likewiſe oblong, pointed, and jagged leaves like the preſent one; but we do not recollect, whether the leaves of the abſent plant were, in other reſpects, like thoſe of the preſent. Now, as we happen to be able to recollect more or fewer marks, our notion will be more or leſs obſcure.

Examples of obſcure notions.

XI. And thus we have very obſcure notions of all thoſe words, the meaning of which we do not rightly know, though their ſound be familiar to us, and, if attentive, leave us not quite without thought. For example, the term, Virtue, is generally

rally known; and, as we denominate many actions of men virtuous, and, on the contrary, many vitious, we muſt of neceſſity have ſome notion of them: But it is ſtill very obſcure, if we can account virtue vice, and vice virtue. I here ſpeak of thoſe caſes, in which one ſeriouſly, and not from intereſted views, paſſes a wrong judgment, and thinks as he ſpeaks.

Precaution neceſſary in the caſe of obſcure notions.

XII. But we muſt be on our guard, not to judge that no one elſe can join a clear notion with the terms of which we only have an obſcure one; as otherwiſe we would deem Obſcure abſolutely, and in itſelf, what notwithſtanding is but a bare defect in our knowledge, and reject words as mere empty ſound, which yet have their proper meaning. Thus ſome reject the centripetal and centrifugal forces of the modern philoſophers, having no juſt notion of their meaning: Others make a jeſt of infinitely ſmall quantities, or infiniteſimals, in geometry, as they underſtand not the proper meaning of that term. Nay, many, for this reaſon, deem all technical terms, particularly thoſe in the old ſyſtems of metaphyſics, obſcure, as they know not rightly, how to explain them.

Diſtinct and undiſtinct or confuſed notion, what.

XIII. If the notion we have is clear, we can, in that caſe, either repeat to another the characters or marks, by which we

diſtinguiſh a thing; or at leaſt can repreſent them to ourſelves, in particular, one after another; or we cannot do either. In the firſt caſe, the clear notion is diſtinct, but in the other undiſtinct or confuſed. For inſtance, one has a clear and diſtinct notion of a Clock, when he can ſay, it is a machine, which, by the revolution of an index or hand, ſhews the hours, or by ſtriking on a bell, proclaims them. The diſtinct notion of Illumination is, that it is a ſupernatural conviction of ſuch truths, as we cannot naturally comprehend. Under this head comes alſo, that a ſtate of Matrimony is a ſociety, or an union of man and wife, in order to propagate and bring up children: That Virtue is a readineſs, or habit, to render ourſelves and others as perfect as our powers will admit of: That Rain is a number of water-drops, falling both ſimultaneouſly and ſucceſſively from the clouds, through the air: That Omnipotence is a power of imparting exiſtence to every poſſible thing: That Salt is a hard body, which diſſolves in water, and becomes fluid. Whoever wants more examples, need only conſult the ſeveral parts of my philoſophical writings, where he will find diſtinct notions of every thing. But, on the contrary, our notion of a Red colour is clear, yet undiſtinct or confuſed. We can, it is true, know a red colour, when

when it offers to our view, but yet are unable to expreſs to another, by what marks we know it. Thus, many have, indeed, a clear, but undiſtinct notion of the different Species of trees and plants; for, they can know one from the other, but yet are at a loſs to expreſs, wherein their difference conſiſts. The like confuſed notion, is that of the Whiſtling of the wind, the Roaring of the ſea: Of the difference of taſte and ſmell, we have only clear, but no diſtinct notions.

Both, how to be imparted.

XIV. We, therefore, can impart to another, a diſtinct notion by bare words; but a confuſed one, no otherwiſe, than by exhibiting or preſenting the thing or object to him. For inſtance, if one is blind, uſe as many words to him as you will, he never will have that notion of a red, or other colour, which we, with our eyes, have of them.

Complete and incomplete notions.

XV. A diſtinct notion, is either complete or incomplete. A notion is complete, when the characters or marks aſſigned, are ſufficient to diſtinguiſh the thing at all times from all other things. On the contrary, incomplete, if we cannot repeat all the marks or characters, or but a few only, whereby one thing is diſtinguiſhed from another: For example, we have complete notions of Lively Knowledge, Uſufruct, Colic, Un-

derſtanding, Dew, Covetouſneſs, &c. when we can ſay, lively knowledge is that which inclines or influences the will, or yields a motive to will ſomething: Uſufruct, is the right to procure to one's ſelf, from the property of another, all the profit and advantage one will, yet conſiſtently with the preſervation of the thing itſelf, in uſe and enjoyment: The Colic is an acute and fixt pain in the bowels: The Underſtanding, is the faculty of conceiving poſſible things: Dew, is a collection of very ſubtle vapours, which, in the abſence of the ſun, fall down gradually out of the air, and adhere to the upper ſurfaces of the bodies on the earth: Covetouſneſs is a deſire of having more than one's neceſſity requires, and than according to his circumſtances he can lawfully earn, &c. In my philoſophical writings, are inſtances abundant of complete notions ſufficient to know the difference. On the other hand, the Carteſians have an incomplete notion of Body, when they ſay, it is a thing extended in length, breadth, and depth; as by this character or mark alone, we cannot diſtinguiſh Body from Space, which, therefore, the Carteſians hold to be the ſame with body. More inſtances of incomplete notions will be found in the writings of moſt learned men.

XVI.

XVI. In fine, a Diſtinct notion is either adequate or inadequate. Our notion is adequate, if we have clear and diſtinct notions alſo of the characters or marks, by which we know a thing. On the contrary, it is inadequate, if we have but confuſed notions of the characters which diſtinguiſh a thing. For example, if one can not only ſay, that a Clock is a machine, which, by the ſtrokes on a bell, indicates the hours, but has alſo diſtinct notions of the ſtriking on a bell, of the hours, and of the indication; his notion of a clock is adequate: But, if his notions of all theſe things are ſtill confuſed, his notion of a clock is ſtill inadequate. The notion of Pleaſure is adequate, when we can not only ſay, it is a ſenſe of perfection, but, moreover, when we have alſo diſtinct notions of Senſe and Perfection. In like manner, the notion given above (§ 15.) of Lively Knowledge, is adequate, if we can farther define, what is knowledge, what is the will, and what inclining the will. The notion of Uſufruct is adequate, if we have diſtinct notions of right, of another's property, of uſe and fruit, and of the preſervation of the thing intire: Juſt ſo it holds with the other inſtances given above. Examples of adequate notions cannot ſo commodiouſly be adduced, as it proves tedious ſtill farther to reſolve the notions contained in a mark or character. But there

Adequate and inadequate notion, what.

can be no better way of learning what are adequate notions, than by peruſing, with care, the definitions I have given, particularly in my Latin Elements of Mathematics, as no word is employed in the definitions following, which has not been explained in the foregoing. Nay, though, ſome terms are aſſumed undefined, they are of ſuch a nature, that a perſon may reſt ſatisfied with the clear notions which are given of them, or look for a farther explication in the Metaphyſics. And, for this very purpoſe, we may uſe the definitions in metaphyſics, morality, politics and phyſics. For inſtance, I define (Moral. § 64.) Virtue to be the habit of regulating our actions by the law of nature. I alſo ſhew, (Met. § 525.) what is Habit; (Mor. § 1.) what are the Actions of men; (Mor. § 17.) what is the Law of Nature: Whatever ſtill offers in theſe definitions, is again farther defined; as in the law of nature, there is mention made of Obligation and of Free actions: And, (Mor. § 8.) there is a definition given of obligation; (Mor. § 1.) of a Free action; (Met. § 519.) of Freedom; and of Nature, (Met. § 629.) And any one may carry on, at pleaſure, the analyſis of notions to a ſtill greater length, when he muſt be ſenſible, what degree of knowledge my method of philoſophizing enſures.

XVII.

XVII. But adequate ideas or notions have their different degrees; as the notions of the characters or marks, of which they conſiſt, may be anew analyſed or reſolved into others: For example, in the caſe of the clock; by the hour I underſtand the four-and-twentieth part of a day: And thus the notion of the hour may be again reſolved into the notion of the number twenty-four, of the part, and laſtly of the day. And, as again, theſe notions contain their characters, they may be ſtill farther analyſed anew. The ſame thing likewiſe holds of the other examples above-given. Degrees of adequate notions.

XVIII. Yet it is no ways neceſſary, and very rarely is it poſſible, for us to bring this analyſis to a concluſion, that is, to carry it on till we come to ſuch notions, as cannot be farther analyſed; but we may be ſatisfied with carrying it on ſo far as is neceſſary to our preſent purpoſe: As when we want, either to ſignify to another what we mean, or to form a demonſtration therefrom. And thus, in the firſt caſe, we obtain our end, when the other fully underſtands our meaning; that is, when we have carried on the analyſis to ſuch characters or marks, whereof the other has notions altogether clear: And, in the other caſe, when nothing farther remains to be demonſtrated; as will be better underſtood lower down. Analyſis of notions how far to be carried on.

For example; Euclid aſſumes the terms Equality, Greater, Leſs, without defining them, ſatisfied with the clear notions we all have of them, as he could demonſtrate every propoſition he undertook to demonſtrate, without the uſe of the notions of equality, greater and leſs; whereas, in my Latin Elements of Arithmetic, (§ 15, 20.) I have given diſtinct notions thereof, as I had occaſion for them, in order to demonſtrate thoſe propoſitions, which Euclid has aſſumed as principles without demonſtration; and, in ſome caſes, carried my demonſtrations farther than Euclid has done; as I had in view, not only the inſtruction of the reader in geometrical truths, but the exerciſing him in the practice of reflection, and demonſtration.

Diſtinct notion, how obtained.

XIX. We gain a diſtinct notion, when the object we repreſent to ourſelves, contains not too many diſtinct things; and when ſuch as we find therein, may be eaſily diſtinguiſhed; and laſtly, when, in particular, we conſider whatever may be diſtinguiſhed, and then compare the one with the other, and attentively examine their order and connection: For inſtance, a Table; we diſtinguiſh two parts therein, namely, the board, and the frame; the former lies upon the latter, and is ſo faſtened thereto, as not to puſh off. Now, to make this notion ſtill more adequate,

we

we muſt farther examine, what may be diſtinguiſhed in the board, and what in the frame; which would be needleſs to ſet down here at greater length. So, to have a diſtinct notion of the Will, we muſt exhibit to ourſelves an inſtance of our willing a thing for the firſt time, and attend to what happens in the mind, till we come to the act of willing: For example, Titius, who has hitherto with laudable diligence applied himſelf to ſtudy, in proſpect, ſome time or other, to be promoted to a higher degree, hears of an employment near the perſon of a great man, whoſe favour, if he gains it, may be highly ſerviceable: Now, as Titius conſiders this employment as a means of promotion, he ſcruples not to accept of it. Here we find, firſt, a thing, which Titius weighs with himſelf, namely, the employment, which is offered him: Secondly, the repreſentation he forms of it with reſpect to himſelf; namely, that it is a means of his promotion, that is, that it is good for him: Thirdly, The ſtate of his mind upon this repreſentation; namely, that he is not only pleaſed with this employment, on account of this repreſentation, but alſo obſerves in himſelf an inclination towards it. Now, upon taking all this together, we find, that the will is an inclination of the mind towards a thing which

which we repreſent to ourſelves as good. The manner of obtaining diſtinct notions, is illuſtrated by two examples, (Met. § 133, 543.) on the heads, Order and World: And the other diſtinct notions in the Metaphyſics, Morality, Politics and Phyſics, may, in the ſame manner, ſerve as exemplifications.

Adequate notion, how acquired.

XX. Hence it is clear, how adequate notions are obtained, as we need only endeavour to procure farther diſtinct notions, in the manner preſcribed, of the objects we have already a diſtinct notion of: And here it will be of peculiar ſervice, to examine, by theſe rules, the notions of things, of which I treat in the following parts of philoſophy. What was ſaid above (§ 16.) of adequate notions, may ſerve for illuſtration.

When we may be ſaid to have a confuſed notion.

XXI. On the other hand, we may hence ſee, when we have but a confuſed notion of a thing; which happens, either when too many things are to be diſtinguiſhed in an object, but undiſtinguiſhable by us; or, when, ſuppoſing this not to be the caſe, we omit to attend to each in particular, and to conſider their order and connection. Thus it is very poſſible to procure an adequate notion of a table, and yet many have but a confuſed idea of it, though a thing daily before their eyes; juſt ſo is it poſſible for us to gain a diſtinct notion of Wiſdom, for it contains ſeveral things,

things, whereby it may be diſtinguiſhed from other endowments of the mind; and yet many have but a confuſed notion thereof; as by comparing the different actions, ariſing from Wiſdom, they are never at pains to ſelect thoſe particulars that are proper thereto. It is alſo poſſible to gain a diſtinct notion of Time; for we can very well diſcover, wherein it differs from other things; and yet, moſt people have but confuſed notions thereof, as they attend not to thoſe particulars that convey the notion of it to their mind, in the ſucceſſion of their own thoughts, and of the phænomena in the viſible world: Juſt ſo it holds with reſpect to Reaſon, and a thouſand other things. And, notwithſtanding a contemptible Worm conſiſts of very many parts, mutually diſtinct in it, as well as in the largeſt animal; yet we cannot gain a diſtinct, much leſs an adequate notion thereof, if we are at no pains to diſtinguiſh thoſe parts by the eye. In like manner, the notion of Colours, of the ſeveral ſpecies of Taſte and Smell, and of Sound, remains confuſed, as in all theſe there are innumerable minutiæ or niceties, which it is impoſſible for us to diſtinguiſh from each other; the reaſon of which, will be ſhewn in another place, (Met. § 771.)

XXII. Hence, the great uſe of magnifying Uſe of magnifiers

and teleſcopes.

fying glaſſes towards gaining diſtinct notions, which would otherwiſe be impracticable: For inſtance, we find, that the pith in vegetables, is a congeries of veſicles; that the ſparks, ſtruck from ſteel with a flint, are glowing particles of ſteel and flint, which ſometimes melt and turn to glaſs; that the burning of nettles is, in fact, nothing but a ſtinging, which is done by means of ſubtle ſtings, ſticking here and there on the leaves: More inſtances may be found in Leuwenhoek's Letters, and in Hook's Micrographia. The like aſſiſtance we ſometimes draw from teleſcopes, to which we are greatly indebted for many diſcoveries in the ſyſtem of the world: For example, that the Milky Way is a collection of ſmall Stars; that the ſurface of the Moon is mountainous, and not level; that Venus and Mercury are ſubject to increaſe and decreaſe like the Moon.

Notion obſcure, when.

XXIII. Laſtly, our notions cannot fail to be obſcure, firſt, if the things we perceive are either ſo minute, or ſo diſtant, that we are not able to diſtinguiſh them as they really are in themſelves; in regard our ſenſes can diſtinguiſh neither any thing in them, nor the things themſelves from each other: As if in the twilight we ſee ſomething white at a diſtance, which we cannot always tell what to make of. Again, if that which properly belongs to the

the object, and whereby it is distinguished from other things, lies buried amidst many circumstances that are foreign to the notion we want to gain; as in the several instances of Cause, End, Essence: Thirdly, in like manner, if we attend not duly to the object, nor suffer our thoughts to dwell long enough thereon; as in a garden passing by an exotic or foreign plant, whose name we are told by the gardener, but our thoughts and eyes being more engaged on other objects, than on the plant, or hurrying from one vegetable to another, upon quitting the garden, we cannot properly recollect any thing about the plant; either excusing ourselves, that we did not rightly observe it, or that we forgot it again. And hence we see the reason of so much obscurity prevailing hitherto in the Sciences: The second reason in particular shews, why so thick a darkness has overspread Metaphysics, whereby the other Disciplines have been greatly obscured: But we see also in what manner I have dispelled those clouds of darkness, and introduced broad day even into Metaphysics.

Notions how degenerating.

XXIV. Now, as we are usually apt to forget, either that which we do not often think on, or on which we do not sufficiently think, or directly again turn our thoughts therefrom on some other object; the characters or marks, whereby we di-

ſtinguiſh objects, may again eaſily eſcape us; and hence our adequate notions may become inadequate; our diſtinct, confuſed; and our confuſed, obſcure; nay, every notion may be ſo loſt, as to render us incapable to recover, in any meaſure, the abſent object again to our thoughts.

Depravation, how to be avoided.

XXV. In order to prevent the depravation of the notions we have once gained, we muſt have their repreſentation often before us, and muſt carefully obſerve, not to confuſe ourſelves with too many things at once. But, particularly in the ſciences, it is adviſable to write down the diſtinct notions we have once got; as from paper they are not ſo eaſily effaced as from memory: The following are uſeful rules for ſtudents, *viz.* diligently to repeat what they have once learned; not too many things at a time, and every thing in ſuch regular order, as to obſerve how the knowledge of one thing depends on that of another.

Second method of getting notions.

XXVI. Upon comparing the notions of different things together, we either meet with ſome things, which they have in common, whereby they are ſimilar; or with things peculiar to each, whereby they are different: For inſtance, on comparing the notion of a right lined Triangle with that of a Square, I find, that both are contained under right lines. On the contrary, if I compare the notion of Joy, which is an affection,

affection, ariſing from the poſſeſſion of a preſent good, with the notion of a red colour, I find they have nothing in common or ſimilar. In the firſt caſe, I can ſeclude or ſelect that which is common in both notions, and by this means form a new notion, which agrees to both; as in the given example, the notion of a right lined figure, *viz.* that it is a ſpace, contained under right lines. In like manner we draw from the notion of man and beaſt, the general notion of Animal; from the notion of Animal and Vegetable, the general notion of Living Creature; and from the notion of Piety, Liberality, Gratitude, &c. the general notion of Virtue: Though I deny not, but that we may, in another way, particularly in Morality, Politicks and Oeconomics, draw general notions from certain known principles, as will be ſhewn below, Chap. V. Things are ſaid to be of the ſame Genus or Species, which have a notion in common; namely, of the ſame Species, if the notion is common to ſeveral ſingular and individual things; but of the ſame Genus, if the notion is common to different ſpecies; and a notion common to ſeveral genuſes conſtitutes the ſuperior genus.

XXVII. All that we find in individuals, is, in every reſpect, determinate, as well intrinſecally as extrinſecally; that is, conſidered Farther explained.

ſidered both in relation to external objects, and abſolutely or in themſelves: For, that which conſtitutes this Triangle, I am now drawing, an individual, is nothing but its determinate ſides and angles, and its being drawn with this pencil, on this paper, and at this time: Now, if we abſtract the extrinſecal determinations, and retain the reſt, we have a notion common to ſeveral individuals; again, abſtracting the intrinſic determinations in the Triangle, *viz.* the ſides and three angles, the notion contains whole genuſes, or different ſpecies of individuals. And it is plain, without my hinting it, that we may leave out as many intrinſecal determinations as we will, and thus aſcend to notions ſtill more general: For example, in the notion of the right-lined Triangle, namely a Space contained under three right lines, omitting the ſpecies of lines, there remains the notion of a Triangle in general; or, omitting the number of lines, there remains the notion of a right-lined figure; and omitting both the ſpecies and number of ſides, there remains the notion of a plane figure in general. In the preface to the ſecond edition of the Metaphyſics, I have ſhewn, how this doctrine may be moſt clearly illuſtrated by the formulas of polygonal numbers, and by other algebraical formulas; becauſe, here it is plain, what can, and in what

what manner every thing may be determined; while, in other things, they lie concealed, eſpecially in the caſe of individuals: For illuſtrating this doctrine, what we have ſaid about the ſeveral ſpecies of laws, (Mor. § 17.); of Conſcience, (ib. § 74. ſeqq.); as alſo of the different forms of Government, (Polit. § 233. ſeqq.) will be of ſervice, when duly weighed; that is, in the latter caſe, if either the ancient or modern forms of government be compared together, and general notions be thence drawn in the manner I have preſcribed. For farther illuſtration may ſerve what I have ſaid about the difference of individuals, their ſpecies and genuſes, in my remarks on the Metaphyſics, (§ 53.); as alſo on Eſſence, (§ 16.)

Some notions general, and why.

XXVIII. When a notion agrees to all of a ſpecies or genus, it is called general; and the more general it is the fewer determinations it contains; conſequently, (if we are accuſtomed to general notions, and they are become familiar, and do not appear ſtrange to us) the greater the number of things is to which they agree, the more eaſily are they conſidered.

General notions, their uſe.

XXIX. We apply ourſelves to gain general notions, in order thereby to extend the boundaries of our knowledge. For, whatever is drawn from a general notion, agrees to all things contained under it:

For example, to all right-lined triangles, whatever is deduced from the notion of a right-lined triangle; to all affections, what flows from the notion of an affection; to all fluids, every thing that derives from the notion of a fluid, &c.

Third method of gaining notions.

XXX. But, as we gain new notions on omitting ſome intrinſic determinations; we, on the other hand, may determine in a different, what is already determined in a certain manner; as alſo determine what remains ſtill undetermined, in a poſſible manner. For inſtance, in the notion of a right-lined Triangle, that it is a ſpace contained under three right lines, the ſize or magnitude of the lines is undetermined: If, then, I ſuppoſe all three to be mutually equal, I get the notion of an equilateral Triangle; if, in the place of right lines, I put curves, I procure a curvilineal Triangle: In the ſame manner, if, in the notion of joy, adduced above (§ 26.) I farther determine the perſon, of whom I have received the good I poſſeſs, I get the notion of gratitude; as an affection ariſing in our minds, on repreſenting to ourſelves the perſon who was the cauſe of our preſent happineſs. In the ſame manner, we may draw notions of ſeveral ſpecies of Underſtanding, of Vice and Virtue; if, in the firſt caſe, we determine the ſeveral ways, in which things poſſible may be repreſented,

(for

(for the underſtanding is the faculty to repreſent poſſible things, and according to the ſpecies of repreſentation, muſt be the ſpecies of underſtanding;) in the other caſe, the different circumſtances and principles of Actions: To this head we may refer the ſeveral ſpecies of laws, and of different forms of government, (§ 27.); as alſo the different ſpecies of immaterial beings, which, in ſome degree, are ſimilar to our ſouls, (Met. § 900, ſeqq.)

Poſſibility of notions whence known.

XXXI. If by the ſenſes we are led to a notion of any thing, we are not to doubt its poſſibility; For, who can entertain a doubt of the poſſibility of a thing that really exiſts? And therefore, ſuch notions afford a ſure ground of ſolid knowledge.

Poſſibility of general notions.

XXXII. And, as univerſal and general notions contain nothing but what is in the particular notions, from which they are abſtracted; ſuch muſt alſo be poſſible, if abſtracted from poſſible things.

Of arbitrary notions.

XXXIII. But, if we determine any notions arbitrarily, (§ 30.); we cannot know, whether theſe notions are poſſible, or whether we are deceived by empty ſounds, as our arbitrary will can render nothing poſſible. Wherefore, in ſuch caſes we muſt ſhew, that theſe notions contain what is poſſible: Nor is it ſufficient, that the determinations are in themſelves poſſible, but it is alſo requiſite, that they be conſiſtent with the

other determinations in a thing: For example, it is equally poſſible for two lines to be either right or curve; but, if you farther add, that they contain a ſpace, or that both ends ſhall meet; this, indeed, anſwers in the caſe of curve, but not of right lines.

How this appears from experience.

XXXIV. We come to know, that notions are poſſible, either by experience, or in conſequence of a demonſtration. Experience teaches, whether a notion be poſſible, upon looking round us, and obſerving, whether we find any thing in nature that agrees therewith. For inſtance, I want to know, whether there is actually ſuch an affection as that of gratitude, of which we have (§ 30.) given a notion. I therefore enquire, what good I am in poſſeſſion of, and to whom I am indebted for it: I no ſooner repreſent this to, than I turn my attention upon, myſelf, in order to obſerve what alteration happens in my mind; and I ſhall then find, that the notion is poſſible: Only we are to obſerve, that we muſt be fully convinced, or at leaſt have ſome perſuaſion, that we enjoy a good, and are obliged to another for it. For, I ſhall ſhew in another place, that no knowledge excites a man to action, but what is accompanied by conviction or perſuaſion. The different forms of Government, and all their poſſible combinations, (Polit.

§ 233.

§ 233, ſeqq.) are formed by arbitrary determinations of the number, and extent of power of the Governors (§ 30.) But that ſuch forms are poſſible, may be learned from experience, upon a ſurvey, either of thoſe formerly in vogue, or of thoſe actually taking place at this day. In the ſame manner may be ſhewn, the poſſibility of the different ſpecies of ſimple beings, (Met. § 900. ſeqq.)

How from demonſtration.

XXXV. By Demonſtration we make out, whether a notion is poſſible or not; either when we ſhew the manner of the Riſe and Origin of a thing; or when we examine, whether any thing flows from it, the poſſibility of which we already know: For, when we underſtand in what manner a thing can riſe, we no longer doubt of its poſſibility. If from any notion impoſſibilities ſhould flow, that notion itſelf cannot be poſſible; but if poſſibilities flow, the notion muſt of neceſſity be poſſible: For, what flows from another, can itſelf therefore be poſſible, becauſe, that other is ſo. Thus Euclid demonſtrates, that an equilateral triangle is poſſible, when he teaches how to deſcribe ſuch a triangle on any given right line. In like manner it is plain, a machine is poſſible, when I truly ſhew its method of conſtruction. And thus in Morality I ſhew, that Virtues are poſſible, when I explain, in what manner they are

produced in the ſoul. On the contrary, I find, that a right-lined figure of two lines is impoſſible; as thence it follows, that two right-lines may interſect each other in two points, though it be from other conſiderations certain, that they can interſect but in one. By theſe rules I demonſtrate the poſſibility of moſt moral definitions.

A definition and deſcription, what.

XXXVI. If a diſtinct notion is complete; (§ 15.) that is, of ſuch a nature, as only to agree to the individuals of the ſame ſpecies or genus, and conſequently to be diſtinguiſhable at all times from all other things, that have any affinity with them, this I call a Definition; which conſequently is a diſtinct complete notion of a ſpecies or genus: But if, in conſequence of a notion, we can diſtinguiſh a certain thing under given circumſtances only, for a given time, from other things preſent; this I call a Deſcription. Thus the notion of an eclipſe of the moon, namely, a privation of light at the full moon, is a definition; for thereby I can diſtinguiſh an eclipſe of the moon from all other phænomena in the heavens. In like manner is framed a definition of the underſtanding, that it is a faculty of repreſenting diſtinctly poſſible things; as thereby I can diſtinguiſh it from the other faculties of the ſoul. To this head belong ſeveral other examples,

examples, adduced above, (§ 13.) of diſtinct notions; and there are ſo many inſtances, in all the branches of Philoſophy, which I have publiſhed, as there are different things there treated. On the other hand, if I order a perſon, who never ſaw a citron, to fetch me one from my Study, telling him, that it is a yellow, and ſomewhat oblong fruit, ſtanding on a little table to the right hand, on entering the Study; this diſtinct notion is a deſcription, as by it I can diſtinguiſh the citron only under certain circumſtances; namely, ſo long as it remains on the ſame table in the Study.

Requiſites of both.

XXXVII. And therefore, Definitions muſt contain ſuch characters or marks, as, taken together, can never agree to any other thing: Whereas, for Deſcriptions it is enough, if the marks agree to no other thing, at the time the thing is to be diſtinguiſhed.

Farther Requiſites.

XXXVIII. But, both of them muſt have ſuch characters, as are known to the perſon, to whom I would define or deſcribe a thing, as otherwiſe it would be impoſſible for him to diſtinguiſh it. If this cannot be done, neither Definition nor Deſcription can be underſtood.

Special requiſites of a definition.

XXXIX. And therefore, in the ſciences, nothing muſt be taken into a Definition, which either is not reaſonably preſuppoſed

to be known, or is not previouſly defined: For example, when in the Politics (§ 235.) I ſay, that Monarchy is a form of government, wherein the publick welfare and ſecurity are in an abſolute or unlimited manner intruſted to the care of a ſingle perſon; it was previouſly ſhewn, (ib. § 233.) what is a form of government, wherein (ib. § 213.) the common welfare and ſecurity conſiſt, and (Met. § 924.) what is a perſon; and farther (Polit. § 234.) is illuſtrated, what is meant by abſolute or unlimited. But I may reaſonably preſuppoſe a perſon acquainted with what is taught in another diſcipline or ſcience, from which a ſecond borrows its principles, or with what may be known by daily experience: For inſtance, whoever would learn Aſtronomy, muſt previouſly underſtand Geometry: And therefore, it is no ways unreaſonable, if, in aſtronomical definitions, I uſe ſuch terms, without farther illuſtration, as are uſually defined in Geometry. Whoever would learn Morality, as a ſcience, in which the nature of virtue and vice is deduced from the more intimate knowledge of the ſoul of man, as I have treated it, muſt firſt learn Metaphyſics, which treats of GOD and the ſoul of man: And therefore, it is no ways unreaſonable, if, in the definitions of virtue and vice, I employ ſuch terms, without farther

farther explanation, as have been already explained in the Metaphyſics. Whoever would attain to a ſolid knowledge of Politics, muſt firſt ſtudy Morality, as borrowing ſeveral principles therefrom; as may be ſeen from my treatiſe on the ſubject: And therefore I may, without definition, aſſume in the Politics the terms defined in Morality. In like manner, there is no occaſion in the above definition of a lunar eclipſe, that I ſhould premiſe, what I mean by light, as it is what every one may learn from daily experience.

Farther requiſites.

XL. Nor muſt any improper or figurative terms be uſed in definitions, without being firſt defined: For example, I cannot ſay, that Obligation is a band or tie of right, *(vinculum juris)*, whereby a perſon is bound to do or omit ſome things; unleſs I firſt define the meaning of the term, band of right, as not taken here in its proper ſenſe. In the ſame manner, I cannot define the Underſtanding by the light of the ſoul, nor Reaſon, by a chain of truths, without firſt defining, what this light and chain mean.

Diviſion of definitions.

XLI. Definitions are either nominal or real; Nominal are the enumeration of ſome properties, whereby a thing is diſtinguiſhed from all others; the Real, is the manner, in which a thing is poſſible: For inſtance, if I ſay a Clock is a machine, which

which ſhews the hours, I thus give a nominal definition of a Clock; but if I point out its ſtructure, I give a real definition. In like manner, if I ſay, that Reaſon is the faculty of perceiving the connection of general truths, I give a nominal definition of Reaſon; but if I ſhew, how ſuch Perception is poſſible by the powers of the ſoul, the definition becomes real.

How to frame nominal definitions.

XLII. And thus, nothing muſt be taken into a nominal definition, but what at all times agrees to a thing: For example, in the caſe of Gratitude, there is always a remembrance of benefits; and therefore, this is (Met. § 469.) taken into its definition. Now, in order to know that which is conſtantly in a thing, we are carefully to inquire into the reaſon of this or the other notion agreeing to a thing; for, if I find the reaſon in the thing itſelf, I may be aſſured, that it conſtantly and invariably agrees thereto: On the contrary, if the reaſon thereof is to be ſought for without the thing, it can only agree thereto in certain cicumſtances, or under certain conditions. Now, as nothing can act upon another immediately, without being contiguous thereto; I muſt remove a thing from its preſent contiguity with ſome things to a contiguity with other things, and then it will preſently appear, whether any thing agrees thereto, only in

in certain circumſtances: For inſtance, I ſuppoſe a perſon that never ſaw Wax, finds a piece, in hot ſummer weather, lying in the window, where it turns quite ſoft: Now, in order to know, whether the reaſon of the ſoftneſs of the wax, be in, or out of the wax; I need only convey it into a cold place, as a cellar, and here it will turn hard; and thus I come to learn, that wax is not always ſoft, but only in the warmth. A Stone, on the contrary, whether in warm or cold air, remains ſtill hard; and conſequently, the reaſon of its hardneſs is not external, but internal, in itſelf.

XLIII. We are, in particular, to be on our guard, that nominal definitions do not barely conſiſt of other ſynonimous words, or words of the ſame ſignification with the word or term to be defined; for thus I ſhould become no wiſer than I was before, nor be able to demonſtrate any thing from it, much leſs diſcover what is ſtill unknown. For example, if one ſhould define the term Infinite, by ſaying it is a thing that wants limits; this is far from giving a diſtinct notion of infinite; as the having no limits, and being infinite, leave the matter juſt as it was. Again, if one ſhould ſay, the attractive force of the load-ſtone, is a force, whereby the load-ſtone draws iron to itſelf; the perſon is at a needleſs

First defect of nominal definitions.

needleſs expence of many words to expreſs what he had ſaid before in one.

Second defect.

XLIV. We are alſo to be careful, not to define terms mutually one by the other, or this by that, and that again by this, by uſing a circle in our definitions; as a notion will never become diſtinct in this manner: For inſtance, if I define an hour by the four-and-twentieth part of the day, and a day by the ſpace or period of four-and-twenty hours; I cannot thereby underſtand rightly either what is a day, nor what is an hour: Juſt ſo, if I ſhould ſay, a Learned Man is a perſon that has ſtudied; and any one ſhould aſk, what is Study, and my anſwer were, the endeavour to become learned; I ſhould not convey either what Study nor what Learned meant. And, in this reſpect, we may greatly miſcarry in the caſe of things ſomewhat remote from our ſenſes; eſpecially in treating of ſubjects out of their ſyſtematic connection: As for inſtance, of Virtue, apart from a ſyſtem of Morality; and, at another time, of the Law of Nature apart: Here it may very eaſily happen, that one ſhall define Virtue by a habit of regulating our actions by the Law of Nature; and then again the Law of Nature, by a rule of virtuous actions; both which definitions are inadmiſſible.

Uſe of nominal definitions.

XLV. Nominal definitions are not only uſeful

uſeful in common life, in order, at all times, to obtain the right names or denominations of things; but in the Sciences they alſo afford a ſolid ground for demonſtration, as may be ſufficiently ſeen from Mathematics, as alſo from thoſe parts of Philoſophy, which I have publiſhed. Nay, we ſhall preſently ſee, how real definitions themſelves are found out from nominal ones.

All things admit not of nominal definitions.

XLVI. Yet it is not poſſible to give nominal definitions of every thing; for they muſt be put together of characters or marks, that diſtinguiſh a thing from all others; all ſuch characters are expreſſed by words: And therefore, it is neceſſary to aſſume ſome words undefined, which we learn, when we hear things preſent, or before our eyes, called by their names; and thus we obtain a clear, though, indeed, an undiſtinct or confuſed notion of them, (§ 5, 9, 13.)

All, but the ſelf-exiſtent Being, admit of real definitions.

XLVII. As every thing, if we except the ſelf-exiſtent Being, has a ſufficient reaſon why it is, rather than is not; or at leaſt why it can be, or be poſſible; ſo things may admit of a real, which admit not of a nominal definition: As for inſtance, no properties, or no marks or intrinſecal determinations can be aſſigned, by which to diſtinguiſh Pleaſure from all other alterations happening in the mind; yet, notwith-

withſtanding it may be ſhewn, how it ariſes; namely, when we are ſenſible of a degree of Perfection in ourſelves, or, at leaſt, imagine, we are ſenſible of it.

Eſſence of a thing, wherein conſiſting.

XLVIII. The firſt thing, which can offer to our thoughts in an Object, and that in which the reaſon of the other things contained therein is to be found, is called its Eſſence: Namely, all the things we diſtinguiſh in every finite being, are twofold; Conſtant, and Inconſtant or Variable. In our definitions, we meddle not with the Inconſtant, but keep entirely to the Conſtant, (§. 42.) The Conſtant are twofold; either they are ſuch, as are not mutually repugnant to, yet not mutually determinable by, each other, nor by other things, contained in the object, at the ſame time; or, they are ſuch as are determinable by each other; ſo that if the one be contained in a thing, the other muſt neceſſarily be ſo too. Now, as theſe laſt have in the firſt the reaſon of their being contained in a thing; the firſt are the Eſſentials, but the laſt conſtitute the Attributes or Properties of a thing. Now, the firſt thing poſſible to be thought of in an Object, is its manner of Formation or Origin, ſo as to be that which it actually is: And therefore, we underſtand the Eſſence of a thing, when we can diſtinctly conceive the manner of its poſſibility. Whence it moreover

over follows, that real definitions explain the eſſences of things: (§ 41.) For example, I underſtand the Eſſence of a Clock, when I diſtinctly conceive its conſtruction, ſo as to be able to explain the nature of the wheels, and other parts conſtituting this machine, and how they are fitted and combined together; nor do thoſe parts neceſſarily co-exiſt, only 'tis poſſible, that they may co-exiſt in the ſame ſubject; and we no ſooner perceive their nature, and their manner of combination, but we can truly account for every effect of a Clock. For the ſame reaſon, I underſtand the Eſſence of Pleaſure, if I know it to be a Senſe of Perfection, real or imaginary. Juſt ſo we underſtand the Eſſence of the Eye, if we know its parts, and their manner of combination, or how they are put together; and this alſo holds of the knowledge of the Eſſence of our Body in general: But if we barely enumerate the Eſſentials, as that a Triangle has three ſides, and at the ſame time ſhew not its manner of Formation or Riſe by means of theſe Eſſentials, we have only a nominal definition; becauſe it does not appear, whether thoſe Eſſentials can co-exiſt in the ſame Subject; conſequently whether the thing defined is poſſible. On this arduous Subject, my larger Logic in Latin, and my Ontology treat at full length.

XLIX.

Requisites to a real definition.

XLIX. Now, as real definitions shew the Origin or Formation of a thing (§ 41.); so there are two things to be considered: First, What things are requisite to its formation. Secondly, What it is that each of them contributes. For example, in order to account for the formation of Vapours, we must not only know, that Water, Heat and Air are requisite, but also understand, what it is each of these three contribute to the production of Vapours.

The several ways of coming thereto.

L. We come to this knowledge by different ways: For the thing, whose definition we want to know, is in some measure either known, or it is not. It is possible that we may know it by a nominal definition.

First way.

LI. If I know nothing at all of a thing, I must assume such things as I already know, and carefully inquire, what may be the result of their combination or connection: For instance, in Geometry, we assume points and lines, and consider one of them moving in a certain manner on the other; as a Line moving always parallel to itself on another at rest, or moving round a fixt Point: And thus we obtain real definitions; in the first case, of a Parallelogram; in the second, of a Circle. A great number of such examples we find in Barrow's Geometrical Lectures, p. 14, seqq. In a like manner, we may combine

the ſimple machines, or mechanical powers, in an infinite manner of ways, and we ſhall procure many Machines we knew nothing of before. A perſon converſant in Chemiſtry, Experimental Philoſophy, and the Arts, may very often uſe this rule with great benefit. And it will be ſeen in the Ethics, Oeconomics and Politics, that moſt of the real definitions therein, were found in this manner.

What in this caſe is to be aſcribed to chance.

LII. Much in this caſe is to be aſcribed to Chance; namely, if either fortuitouſly, or with deſign, we combine ſuch things together, of which we could not aforehand affirm, that they would yield us any thing new, only obſerving what might be the reſult: Thus Teleſcopes were found out, on a fortuitous combination of a concave and convex glaſs. In the very ſame manner Gun-powder was diſcovered, on mixing fortuitouſly together Char-Coals, Sulphur and Saltpetre, and by a ſpark happening to fall among them. And moſt of the inventions in the Arts have no other original. In this manner the Phoſphorus was diſcovered, as Leibnitz informs us at large in the Miſcellanea Berolinenſia, p. 91. ſeqq.

How to know, whether the thing actually exiſts, whoſe definition is found.

LIII. If by this arbitrary combination of ſome things, the geneſis or formation of any thing is diſcovered, and we want to know, whether it is already known, and by what name it is called; we muſt

draw from the real definition ſome of its attributes or properties, and then conſider, whether any other thing is to be found with ſuch properties: For, whatever is collected from the definition of a thing, agrees with that thing, becauſe the definition agrees with it: This we carefully obſerve in Mathematics; when we inquire, whether a curve, which we have found, has already any peculiar name among Geometricians, from its geneſis we draw ſome property of it; obſerving whether there is any of that property among the Curves known to Geometricians. Thus in the Elementa Analyſeos Finitorum, (§ 597.) I have ſhewn, that the Line, which Serlio recommends for the conſtruction of Arches, is an Ellipſis; and (§ 600.) that the Curves, propoſed by Durer and Hartman for the ſame purpoſe, differ not therefrom. I have alſo (Met. § 900.) ſhewn, that the firſt Species of ſimple Beings, that have an affinity with the Soul, are the Monads of Leibnitz. And in the Ethics or Morality it is often ſhewn, that the moral Virtues, which I have drawn from the previouſly-proved principles of the Law of Nature, are the very ſame which are uſually called by this or the other name. For example, I ſhew, (Mor. § 325.) that Leibnitz's Science of Happineſs, is the very ſame with that which I call Wiſdom.

LIV.

LIV. If a nominal definition is given, and we would form from it a real definition, we muſt ſeek out (§ 19.) diſtinct notions of all the characters or marks contained therein; which, if we conſider all that is neceſſary to the geneſis or formation of a thing, will preſently appear: Now, if we farther recollect the things we have learned at another time, and among theſe, ſuch as are requiſite to our purpoſe, we have found out the real definition: But if we cannot bethink ourſelves of any ſuch; we preſently ſee, that the diſcovery is not in our power: For inſtance, if I have a nominal definition of Vapours; namely, that they are aqueous Particles, which mount up high in the Air, I am to find out their geneſis or formation: For this end I recollect every thing I know diſtinctly about Water, the Air, as alſo about the riſing or aſcent of Bodies in fluids; namely, that there is much air in water, that water is expanded into bubbles by air, that air rarifies with heat, that things ſpecifically lighter aſcend in fluids ſpecifically heavier: Now, if theſe principles are, by a juſt reaſoning, combined and mutually compared, it will eaſily appear, that the rays of the Sun darting on water, or water being ſome how or other expoſed to heat, the air, diſperſed through water, becomes rarified, conſequently bubbles

Another method of finding real definitions.

are formed, not only ſpecifically lighter than water, but than air itſelf; which being detached from the water, mount up in the air.

How facilitated.

LV. It cannot be denied, that it is ſomewhat difficult to find out, in the manner preſcribed, real definitions; as requiring, not only a conſiderable ſtock of knowledge, but much practice, or a habit, in cloſe reflection and meditation; and conſequently, it is too great a taſk for the abilities of Novices. But if real definitions ſhould happen to offer, it would be an uſeful exerciſe, were they to be at the pains to inquire, how they might have been found out by the method preſcribed: And becauſe we are here to proceed no otherwiſe than we uſe to do in drawing truths from others we know, or in diſcovering the cauſes of natural Effects: So a greater light will be thrown on this ſubject, on carefully reading what is taught, Chap. VI. concerning the inveſtigation of truth *a priori*.

Third method of obtaining real definitions.

LVI. We may hope to ſucceed more eaſily, in the caſe of organical Bodies, whoſe ſtructure may be viewed either with the naked or armed eye; for here no great depth of reflection is required, only eyes to ſee, attention to obſerve what we ſee, and a ready and dexterous hand at diſſection, or taking to pieces: In this manner, we

we come to have real definitions of Machines actually conſtructed, as alſo of Plants and Animals: And to this head belongs Anatomy, in which the human Body is taken to pieces: But here we are carefully to attend to what was hinted above, (§ 19, 20.) concerning the acquiſition of diſtinct and adequate notions.

LVII. It will prove a matter of no difficulty to acquire real definitions, if we are preſent with attention at the geneſis or formation of a thing. In this manner we learn the works of Art, as alſo get notions of the alterations which happen in our ſoul, as of Pleaſure, Diſguſt, the Affections, &c. Laſt method of gaining real definitions.

CHAP. II.

Concerning the Uſe of WORDS *or* TERMS.

Words or terms, what.

I. BY Words, we uſually make known our thoughts to others: And thus they are nothing but uttered articulate ſigns of our thoughts, for the information of others: For example, if one aſks me, what I am thinking of, and I anſwer, the Sun; by this word I acquaint him, what Object my thoughts are then employed about.

When two perſons may be ſaid to underſtand each other.

II. If two perſons, therefore, are talking together, it is requiſite, in order to be underſtood, firſt, that he who ſpeaks, ſhall join ſome notion or meaning to each word; ſecondly, that he who hears, ſhall join the very ſame notion that the ſpeaker does.

Every word to have a meaning.

III. Conſequently, a certain notion or meaning muſt be connected with, and therefore ſomething be ſignified by, each word.

IV.

IV. Now, in order to know, whether we underſtand what we ſpeak, or that our words are not mere empty ſound, we ought, at every word we utter, to aſk ourſelves what notion or meaning we join therewith. How to know whether we underſtand what we ſay.

V. For it is carefully to be obſerved, that we have not always the notion of the thing preſent to us, or in view, when we ſpeak or think of it; but are ſatisfied, when we imagine, we ſufficiently underſtand what we ſpeak, if we think we recollect, that we have had, at another time, the notion which is to be joined to this or the other word; and thus we repreſent to ourſelves, as at a diſtance only, or obſcurely, the thing denoted by the term, (§ 9. c. 1.) In ſpeaking, the meaning of words not always attended to.

VI. Hence it uſually happens, that when we combine words together, to each of which a-part, a meaning or notion anſwers, we imagine we underſtand what we utter, though that which is denoted by ſuch combined words be impoſſible, and conſequently can have no meaning: For that, which is impoſſible, is nothing at all; and of nothing there can be no idea: For inſtance, we have a notion of gold, as alſo of iron: But it is impoſſible, that iron can, at the ſame time, be gold, conſequently, neither can we have any notion of iron-gold; and yet we underſtand what How words without meaning may be underſtood.

people mean when they mention iron-gold.

Farther proved.

VII. In the inſtance alledged, it certainly ſtrikes every one, at firſt, that the expreſſion iron-gold, is an empty ſound; but yet there are a thouſand inſtances, in which it does not ſo eaſily ſtrike: For example, when I ſay, a rectilineal two lined Figure, contained under two right-lines, I am equally well underſtood, as when I ſay, a right-lined Triangle, a figure contained under three right-lines: And it ſhould ſeem, we had a diſtinct notion of both figures, (§ 13. c. 1.) However, as we ſhew in Geometry, that two right-lines can never contain a ſpace; it is alſo impoſſible, to form a notion of a rectilineal two-lined Figure; and conſequently, that expreſſion is an empty ſound. Juſt ſo it holds with the vegetable Soul of Plants, ſuppoſed to be a ſpiritual Being, whereby Plants are enabled to vegetate or grow: For, though thoſe words taken a-part are intelligible, yet in their combination, they have no manner of meaning. Juſt ſo, if I ſay, that the Attractive Spirit, or Attractive Cord, as Linus calls it, or the Attractive Force, as ſome Philoſophers at this day, is an immaterial principle ſuperadded to matter, whereby the attractions in Nature are performed; no notion or meaning can poſſibly be joined with

with theſe words. To this head alſo belong the Natural Sympathy and Antipathy of Plants; the Band of Right or law, (*vinculum juris*) uſed in the definition of Obligation, by Civilians; the Principle of Evil of the Manicheans, &c.

§ VIII. Now, in order to diſtinguiſh words from things, and never to deceive ourſelves in this reſpect, we muſt not admit of any notion, but whoſe poſſibility we have a juſt knowledge of (§ 41. ſeqq. c. 1.) Words, how to be diſtinguiſhed from things.

IX. But there is here a diſtinction to be made between the notion of the ſound of words, and the notion of the things they denote: For doubtleſs we muſt have a notion of the ſound of words, otherwiſe we ſhould neither hear them, nor reflect on them. For example, I have a notion of the ſound of the term Attractive Spirit, otherwiſe I could not diſtinguiſh, whether I heard this or any other word (§ 4. c. 1.) but yet I have no notion of the thing, denoted by this word. Diſtinction between the notion of a word and its ſound.

X. Now, hence it is very evident, that people may talk together, and even, in ſome degree, underſtand each other, and yet none of them have any notion of what is talked about, in regard the talk is about a pure nothing: Such diſcourſe is not unuſual among the learned; particularly, much Words without meaning intelligible.

much of it is to be found in the natural Philoſophy of the Schoolmen, (§ 7. c. 2.)

Words may denote things, of which we have no knowledge.

XI. But as there are words without any meaning, ſo there may be words, by which ſome actual things may be denoted, of which we have no clear and diſtinct notion, though not ignorant of theſe words: For inſtance, the term Lynx, denotes an Animal, not unknown to huntſmen, alſo celebrated on account of its quickneſs of ſight: Many people know the term, but have no clear, much leſs a diſtinct notion of the Animal.

Abſurdity of rejecting myſteries.

XII. And therefore it follows not, that terms, with which we can join no clear notion, ſignify nothing. As the enemies of the Goſpel give out, that the term Trinity, and ſome other terms, denoting Myſteries, are mere empty ſounds.

Others may have notions of words, of which we have none.

XIII. Much leſs does it follow, if we cannot join a clear and diſtinct notion with a term, that no other perſon can: Such are therefore under a miſtake, who reject all words in Sciences, of which they cannot form any clear and diſtinct idea.

How to be explained.

XIV. Now, in order to another's underſtanding my meaning, I am to uſe no term, but ſuch as I am aſſured he muſt not only have the notion I join with it, but that the term, as ſoon as heard and conſidered, excites the very ſame notion in him: For it very often happens, that another

another ſhall join a quite different notion with the term, from what I do, though he might equally well have joined mine therewith: For example, Simplicius, who from a child has read books of amuſement, and aſſiſted at all the public fooleries and diverſions, repreſents to himſelf acuteneſs of judgment, as conſiſting in the habit of expoſing and ridiculing every thing. But Lynceus, who has uncommonly improved his underſtanding by every ſolid branch of knowledge, takes for acuteneſs of judgment, the habit of demonſtrating his aſſertions, and carrying on a long train of reaſoning, till he concludes it in undoubted principles. Now, ſhould Simplicius ſay to Lynceus, that Thraſo could judge with acuteneſs of a ſubject, Lynceus would be at a loſs to underſtand him, though he had a juſter notion of banter and ridicule than Simplicius. And therefore, but eſpecially in the Sciences, one ſhould define his terms, and again the terms in theſe definitions, till he comes to ſuch, as their correſponding notion may be taken from obvious things, or ſuch as he is well aſſured, the reader knows the true meaning of; which the example given (§ 16. c. 1.) of adequate notions ſufficiently ſhews.

XV. And hence ariſes much diſpute among the learned, when not properly determining the meaning of their words by

Whence Logomachies ariſe.

by diſtinct notions; as one joins this, another a different; nay, the very ſame perſon now this, and again that undiſtinct notion with a word. For when Simplicius, according to his notion, ſays, that Thraſo is a man that judges acutely of a matter; Lynceus, according to his, will not fail to deny it: Simplicius attempts to prove it, from Thraſo's dexterity of exhibiting things in a ludicrous light, and of expoſing the errors of others in a manner ſo palpably ridiculous: But Lynceus will object, that Thraſo knows not what is requiſite to a proper enquiry into a ſubject, and that he turns into ridicule things he does not rightly underſtand: And then Simplicius imagines, his favourite Thraſo is treated by Lynceus with unjuſt cenſure and abuſe; and thus they never will come to a deciſion or point in the matter: But had Simplicius diſtinctly explained what he meant by judging acutely, Lynceus would never have diſputed his character of a low Buffoon. It would therefore be, at firſt, proper, to have an inſtance given, from which Thraſo's acuteneſs of judgment was concluded.

True ſignification of words, how found.

XVI. In general then it is neceſſary, in order to find the proper ſignification of words, to repreſent to ourſelves ſome caſes or inſtances, in which the word is uſed, and then carefully to attend to every thing that

that has given occaſion to our uſe of it. For thus we acquire the characters, by which the thing of this name is diſtinguiſhed from all others: As for example, I want to know the proper meaning of the word Light: For this purpoſe, I exhibit to myſelf what I feel and perceive, when I hear Light named, and what moves me to ſay it is Light: And then I find, that it is ſaid to be Light, when the ſurrounding objects may be ſeen; and that it is very light, when diſtinctly ſeen: I hence ſee, that by Light is underſtood, that which renders the bodies round us viſible. In this manner is the meaning of the terms Space, Order, Contiguity, Truth, Dream, Reaſon, &c. (Met. § 46, 58, 132, 143, 368.) inveſtigated. And in other parts of Philoſophy the preſent rule in like manner holds, whenever we undertake to explain the meaning of a word.

CHAP.

CHAP. III.

Concerning PROPOSITIONS.

When we are ſaid to form a judgment.

I. WHEN we judge, either that a thing has, or may have in itſelf ſomething, or even that ſomething may proceed or ariſe from it; or that it has not, or cannot have ſomething in it; or again, that ſomething cannot ariſe therefrom; we are in all theſe caſes ſaid to form a judgment of it: As for inſtance, we paſs a judgment on a Building, when we ſay, This Building is Elegant; that other is far from being built according to the Rules of Art. We judge of Iron, when we ſay, Iron can be made red hot: Iron cannot float or ſwim. We judge of a ſtone, tumbling down a great height, when we ſay, it might kill one; it will not fly to pieces. In a word, we form a judgment when we think, ſomething does, or does not agree with a thing.

II.

II. And therefore, when we form a Judgment, we either connect together, or ſeparate from each other, two notions or ideas; namely, the notion of the thing, of which we judge, and the notion of that which either agrees, or diſagrees with it: I ſay, two at leaſt; as with theſe two, others alſo may be joined: As for example, when I judge, This Houſe is elegant, I connect the notion of Elegance with the notion of the Houſe: And therefore, in this judgment there are only two notions. But when I judge, A Stone, tumbling down from a height, kills one; there are united with the notion of the Stone, that of the Height and of the tumbling down, and with theſe, the notion of killing: Yet the repreſentation of a ſtone tumbling down from a height, conſtitutes properly but one complex notion, conſiſting of ſeveral ſimple ones, as I am obliged to take theſe all together, in order to the laſt notion, *viz.* Killing, or Death, agreeing therewith: And the ſame holds, when the notion of that which agrees with a thing, conſiſts of ſeveral ſimple notions. And thus the Judgment, or Faculty of judging, is either a connection or a ſeparation of two, or of more notions mutually connected, but which together form only two.

Wherein a judgment conſiſts.

III. Now, as we are obliged, inſtead of notions to uſe words, either when we are to

Propoſitions, what.

Affirmative and Negative, what.

to diſcloſe our judgment to others, (§ 1. c. 2.) or often alſo to repreſent it to ourſelves in thought, (§ 5. c. 2.) a judgment muſt be expreſſed by two words at leaſt; one of which denotes the thing, of which we ſpeak, and the other, that which agrees with it: The former is called the Subject; the latter, the Predicate; and the Diſcourſe, whereby we ſignify, that ſomething does or does not agree with a thing, we call a Propoſition; and in particular, Affirmative, when we ſay, that ſomething agrees with a thing; and on the contrary, Negative, when we ſay, that ſomething does not agree therewith: As for example, when I ſay, The Sky is bright, I affirm ſomething; but if I ſay, The Sky is not bright, I deny ſomething.

A Propoſition, when underſtood.

IV. Now, in order to underſtand a Propoſition, we muſt endeavour to obtain a notion of all the words contained therein: For words are put inſtead of notions (§ 3.): But no words can be underſtood with which we cannot connect a notion, (§ 3. c. 2.) Now, the more intelligible ſuch notions are, the better we underſtand the Propoſition.

Diſtinction of propoſitions.

V. The Ground or Reaſon, why ſomething does or does nor agree with a thing, is either in the thing itſelf, and thus to be ſought for in ſomething which it conſtantly has, as in its Eſſentials, or in its

Attributes, which are the Properties thence derivable, (§ 48. c. 1.); or in ſomething, which it has only at a certain time, under certain conditions or circumſtances; or, laſtly, in ſomething without it: As for example, the reaſon why a Stone is heavy, muſt be ſought for in the Matter of which it conſiſts, and thus in ſomething, which the Stone always has. But if it be aſked, why the Stone warms the Bed; the reaſon is to be ſought for in its warmth; and thus in ſomething, which it can have, only under certain conditions; namely, when laid to ſtand long in the warmth, as in hot water, or on a hot ſtove. Laſtly, when I aſk why the Stone is warm, the reaſon is to be ſought for without it; namely, in the hot water, wherein it ſtood, or in the ſtove whereon it lay. Now, in the firſt caſe, that which agrees with a thing, muſt agree with all of a genus or ſpecies: But, in the ſecond caſe, only with ſome; namely, thoſe which are in the ſame or equivalent circumſtances: As for inſtance, all Stones are heavy; but ſome only do warm; namely, ſuch as are themſelves warm; and only ſome become warm; namely, ſuch as lay long in the warmth: In the firſt caſe, the Propoſitions are called Univerſal or General; but in the two other caſes, Particular. Though when the Propoſition ſpeaks not of a ſingular or in-

dividual thing, particular Propoſitions may be very eaſily changed into Univerſal, if only the condition is added: As for example, ſome Stones do warm, that are themſelves warm: This is a Particular Propoſition; but it will become Univerſal, when I ſay, all warm Stones do warm. In like manner this is a Particular Propoſition, ſome Stones are warm; namely, ſuch as lay long in the warmth: But an Univerſal Propoſition may be made of it, if I ſay, all Stones that lay long in the warmth, are warm: The word All, is therefore the ſign, whereby Univerſal Propoſitions are denoted; which is alſo often omitted; as when I ſay, Stone is heavy, warm Stones do warm; Stones which lay long in the warmth, are warm; and then the Propoſition is ſaid to be indefinite. And on the contrary, the word Some, is the ſign of Particular Propoſitions: But a ſingular Propoſition is ſuch, whoſe ſubject is an individual, and is equivalent to a Univerſal, when the predicate only agrees with the ſingular or individual thing; because, in that caſe, as in that of Univerſal Propoſitions, the reaſon is contained in the ſubject, as alſo in that it may be conſidered as always exiſting therein: And in this caſe they are called Proper ſingular Propoſitions; an example of which is the following; Chriſt is born of a Virgin

for it is equivalent to the Univerſal Propoſition, whoever is Chriſt, is born of a Virgin. But if the predicate be common, the ſingular Propoſition is rightly deemed Particular, becauſe contained together with other Particular Propoſitions under the ſame Univerſal Propoſition. Thus the Singular Propoſition, this Stone is heavy, is contained under this other Univerſal, every Stone is heavy; in like manner as is the Particular Propoſition, ſome Stone is heavy; there being in both caſes the ſame ground or reaſon of Predication.

VI. From all this it appears, that every Propoſition may be very eaſily reſolved into two parts: The firſt, is the Condition or Hypotheſis under which the predicate does or does not agree with the ſubject; namely, as containing in it either this or the other thing, or as being found under this or the other circumſtance. The ſecond part is the Poſition or Theſis, which contains that which can or cannot agree with a thing: As for inſtance, in the Propoſition, the warm ſtone does warm, the Hypotheſis or ſuppoſition lies in the ſtone being warm; but the Poſition, in that it warms: And it may be expreſſed thus, if the Stone is warm, it does warm: and here the ſaid two parts plainly appear. If the condition is explicitely expreſſed, under which the predicate agrees with the

Analyſis of propoſitions.

ſubject, as mentioned juſt now, the Propoſition is ſaid to be Hypothetical: But if the condition only lies concealed in the ſubject, and the predicate is aſcribed thereto without any explicit or expreſſed condition, as when we ſay, the warm Stone does warm, or the ſtone is warm; the Propoſition is ſaid to be Categorical.

Objection anſwered.

VII. It ſhould ſeem, that this Reſolution or Analyſis could not always take place: For, as the Ground or Reaſon, why ſome thing does or does not agree with a thing, muſt be ſought for either in its Eſſentials or Attributes, (§ 48. c. 1); ſo whatever agrees therewith, muſt agree abſolutely, and thus without any condition. And the ſame thing holds of whatever cannot agree therewith: As for example, every Triangle has three angles, without any condition: God is omnipotent, without any condition too. The anſwer is eaſy: Whatever is proper to a ſubject, whether Eſſentials or Attributes, ſuſtains the place of a condition: For the Eſſentials are the condition, under which an Attribute agrees with a thing; or one Attribute is the condition under which another agrees with it; namely, when one Attribute is determined by another, in the ſame manner as this laſt is by the Eſſentials (ibid.): For did not that which is in the number of the Eſſentials or Attributes

agree

agree therewith, neither could the predicate be aſcribed, which ſeems to be abſolutely or unconditionally aſcribed thereto: As in the inſtances juſt given, to the terms, Triangle and God, ſome notion muſt neceſſarily anſwer. The notion itſelf therefore exhibits the condition, under which the predicate is to be aſcribed to the ſubject; namely, in the firſt caſe, that a Triangle is contained under three lines; that God poſſeſſes every perfection in the higheſt abſolute degree: And hence the ſaid Propoſitions may be changed to the following; If a figure is contained under three lines, it has three angles; and if a being poſſeſſes every perfection in the higheſt abſolute degree, he is omnipotent.

VIII. This Analyſis of Propoſitions is of manifold uſe, as will appear as we proceed. And hence alſo in Mathematics, almoſt all Propoſitions are reduced to the form of hypothetical. At preſent I ſhall only mention this; namely, that the condition ſhews, not only the Ground or Principle from which the demonſtration is to be taken, but alſo the characters or marks, from which I may know, that in a given caſe the Propoſition holds. Uſe of the analyſis of propoſitions.

IX. At the ſame time we alſo ſee from this Analyſis, that in every Propoſition two things offer in reſpect to the ſame ſubject, one of which, in an affirmative Pro- Their more intimate nature.

poſition, we aſcribe to it on account of the other; but in a negative, we cannot, on account of the other: As for example, in this Propoſition, God is Omnipotent, (and by God, I, according to Deſcartes, mean the moſt perfect Being); two things I aſcribe to the Being we call God; namely, in the firſt place, the higheſt perfection; in the ſecond place, Omnipotence; that is, a power to do whatever he wills: The laſt I aſcribe to him on account of the firſt. On the contrary, in the Propoſition, no cold Stone can warm; two things alſo occur to conſideration with reſpect to the Stone, cold, and power of warming; but the laſt, namely, the power of warming, I cannot aſcribe to it; if I aſcribe the firſt thereto, namely, cold; the one is repugnant to the other. Now if two notions are ſuch, that the ſecond takes place when the firſt alſo has place; or that I muſt neceſſarily think of the ſecond when I think of the firſt; namely, in regard the ſecond is determined by the firſt; my thoughts or notions in that caſe agree together: But if it is impoſſible to think of the ſecond when I think of the firſt; my thoughts diſagree with each other, or the one contradicts the other.

Some phraſes explained.

X. Upon a diſtinct view of this agreement of thoughts or notions, I affirm, the Propoſition is conceivable. Again, on a diſtinct

ſtinct view, that the notions are repugnant, I then affirm the Propoſition is unconceivable: But if not diſtinctly to be viewed, whether the notions agree or diſagree; I in that caſe affirm, 'tis doubtful whether the Propoſition is conceivable or not; namely, in the firſt caſe, we can repreſent to ourſelves the thing, together with what agrees with it, in our thoughts, without words; but in the ſecond, it is abſolutely impoſſible; and in the third, it is doubtful whether there is any agreement or no. Theſe expreſſions have long been in uſe with Mathematicians and Philoſophers of eminence: But what is a diſtinct view, is evident from what was ſaid above (§ 13. c. 1.) concerning diſtinct notions: As I have a diſtinct view of the agreement or diſagreement of notions, if I can recite, in order, the Reaſons why the notions agree or diſagree; of which more at large in the following Chapter.

Manner of inveſtigating propoſitions.

XI. Propoſitions are either found *a poſteriori*, or by experience; or derived *a priori*, or from definitions, either conſidered in themſelves, or compared together.

Diſtinctions of propoſitions.

XII. Propoſitions expreſs either the agreement or non-agreement of ſomething with the ſubject; or they ſhew in what manner a thing may be made or done. Of the firſt, we have inſtances above (§ 1, 5, 7.) An example of the ſecond is, when I ſay,

that whoever would afford joy to another, muſt know what he earneſtly longs for, and muſt heighten his longing, and then ſurprize him with the thing longed for: Propoſitions of the firſt kind are called Theoretical; of the laſt, Practical.

Axioms and poſtulates, what.

XIII. The Theoretical Propoſitions which are drawn from a ſingle definition, I call Axioms; the Practical, which are derived from a ſingle definition, I call Poſtulates: In general, Axioms and Poſtulates are called ſuch Theoretical and Practical Propoſitions as may be aſſumed without proof; namely, becauſe we aſſent to them without any; whether in that caſe we have an eye to ſome definition or other, or only to confuſed notions of the terms; on which account it is ſaid, that they are manifeſt from the terms: An example will be given, Chap. VI. In propriety, Identical Propoſitions, in which the ſubject and predicate are the ſame, or the ſame notion anſwers to both, are the genuine Axioms; as when we ſay, All Animals are Animals; in regard an Axiom ſhould in itſelf be ſtrictly indemonſtrable, and be ſuch a Propoſition as to which we aſſent without previous demonſtration, on barely underſtanding the terms; when we can no ſooner repreſent to ourſelves the ſubject, but at the ſame the predicate therein offers to our mind. Thus we cannot

not repreſent to ourſelves a Triangle, that is, a ſpace compriſed under three lines, but three angles directly offer to our thoughts.

XIV. The Speculative Propoſitions, which are derived from ſeveral definitions taken together, we call Theorems; the Practical, derived in the ſame manner, Problems; of which we ſhall give more examples in Chap. VI. as we have already given of Theorems above, (§ 1, 5, 7.) and of a Problem (§ 12.) Theorems and problems, what.

XV. This diviſion of Propoſitions is religiouſly obſerved in Mathematics, with each its proper name prefixed; in order directly to ſee to what we are principally to attend, in order fully to underſtand every Propoſition in particular: It alſo contains the Reaſon of the rules, preſcribed below, Chap. VI. for deducing Propoſitions *a priori*, or from their definitions. Nay, the greateſt utility which the art of Logic enſures in very different caſes, is grounded on this diviſion, as will abundantly appear from Chap. VIII. and the immediatly following ones. Uſe of this diviſion.

OF

OF SYLLOGISMS.

CHAP. VI.

Concerning SYLLOGISMS, *and the Manner, how by their Means, to get a full Aſſurance of Truth.*

Affirmative ſyllogiſms, origin of.

I. AFTER having obtained a variety of univerſal or general notions, (§ 19, 20, 26, 27, 30. c. 1.) and connected names with each, (§ 3. c. 2.): From the characters or marks of a thing, by which it is known and diſtinguiſhed from all others, we gather that it is of the very ſame genus or ſpecies, to which this or the other name is appropriated: As for example, if I have once framed a definition, that Light is that which renders the ſurrounding bodies viſible; and if from experience I form this intuitive judgment, that the Moon makes the bodies round me viſible, I thence collect, that the Moon is a Light. Again, if I have formed this definition,

definition, viz. that whoever regulates his actions by the Law of Nature, is virtuous; and from experience I make this intuitive judgment, that Titius regulates his actions by the Law of Nature; I thence gather that Titius is virtuous. In the very ſame manner are univerſal or general Propoſitions to be applied in particular caſes: As for example, we know from experience, that heat expands or rarifies the air: Now we find, that the rays of the Sun are hot; and thus we conclude, the rays of the Sun expand or heat the air. Or, if I have learned from the Principles of Morality, that whoever has a competent ſufficiency, both as to the neceſſaries and conveniences of life, and ſeriouſly complains thereof, is covetous; and if I afterwards know from experience, that Titius is in ſuch circumſtances, and notwithſtanding complains, I conclude that he is covetous.

Principle of ſuch ſyllogiſms.

II. This manner of concluding is extremely evident, as being grounded on this principle; namely, that whatever agrees with a genus or ſpecies, muſt agree with all the particulars contained under that genus or ſpecies: For inſtance, if I aſſume, that the name Light, agrees with that which renders the ſurrounding objects viſible, I muſt of neceſſity give the ſame name to the Moon, which produces the ſame effect;

fect; as Light, and the viſibility of the ſurrounding objects are the very ſame thing: And therefore, of what thing ſoever I affirm the one, I muſt alſo affirm the other. The ſame thing holds as to any other examples.

Origin of negative ſyllogiſms.

III. In like manner, if upon forming an univerſal negative judgment, I afterwards find, that a thing belongs to the genus or ſpecies, of which I have formed that negative judgment, I muſt deny concerning it, what I denied of the whole genus or ſpecies: For example, if I am convinced from experience, that no man takes with him his riches out of this world, and I find that Crœſus is a man; I conclude that he can take nothing with him out of the world. In like manner, if I find not in a thing the characters contained in a definition, I thence conclude, that the name does not agree or belong to that thing to which the definition does not: For example, If I find each point of the perimeter, under which a plane figure is contained, not to be equally diſtant from its centre; I thence gather, that ſuch a figure is not a circle. In like manner, if I know from the principles of Morality, that whoever groundleſsly complains of his good circumſtances, is covetous; I thereby alſo know, that he who complains of his low circumſtances, is not therefore covetous:

covetous: Now, if I know that Titius is but in mean circumſtances, and I hear him complain thereof, I conclude, that Titius is in no wiſe covetous.

IV. This manner of arguing is as evident as the foregoing, for it is built on this other principle; namely, that whatever is denied of a whole genus or ſpecies, muſt alſo be denied of every particular contained under that genus or ſpecies: For inſtance, if no man can take with him any thing out of the world, ſo neither can Crœſus, otherwiſe the univerſality of the firſt Propoſition would be deſtroyed. In like manner, if I know, that no figure can be a circle, in which all the points of the perimeter are not equally diſtant from the centre; ſo neither can an oval line be a circle, without again deſtroying the univerſality of the firſt Propoſition. The ſame thing holds of the third example. Principle of ſuch ſyllogiſms.

V. If we therefore more accurately conſider theſe two principles (§ 2, 4.) of Syllogiſms, it will be ſeen that we therefore aſſume them, as we would otherwiſe grant, that the ſame thing may be and not be at the ſame time: And therefore, the Ground or Reaſon of the truth and evidence of Syllogiſms, is the Principle of Contradiction, whereby we pronounce it impoſſible for the ſame thing to be and not to be at the ſame time. Reaſon thereof.

VI.

Nature of ſyllogiſms.

VI. Now, if we conſider theſe Syllogiſms, or the ſeveral manners of concluding one thing from another, more circumſtantially, in the manner preſcribed (§ 19. c. 1.) for attaining diſtinct notions; we ſhall find, that each Syllogiſm conſiſts of three Propoſitions, and the Propoſitions of three terms, ſo combined, as that two and two ſhall always ſtand together: For inſtance, our firſt Syllogiſm (§ 1.) was,

'Every thing that renders the ſurrounding bodies viſible, is a Light:
'The Moon renders the ſurrounding bodies viſible;
'Therefore the Moon is a Light.'

Here the three Propoſitions lie plainly before our eyes, as alſo the three Terms, two of which each Propoſition conſiſts of; as, 'Renders the ſurrounding bodies Viſible,' is one term; the ſecond, 'a Light;' and then, 'the Moon,' is the third: The ſame thing holds in the other examples of Syllogiſms given above, (§ 1, 3.) Now, for diſtinction's ſake, we call the firſt Propoſition of a Syllogiſm, the Major; the ſecond, the Minor; and both Major and Minor together, the Premiſſes, which being ſuppoſed to be known, we draw from them another Propoſition ſuppoſed to be unknown, which we call the Concluſion, as in our Syllogiſm, the Moon is a Light.

In like manner the first Term in a Proposition is called the Subject; the second, the Predicate (§ 3. c. 3.); and lastly, the third term, which both the premisses have in common, is called the Middle Term.

VII. From what has been just said, it appears, that the middle Term can never be in the Conclusion, but in the Major Proposition is combined with the Predicate, and in the Minor with the Subject of the Conclusion, as in our example; and that the Conclusion is gathered from the Premisses, by combining together the different Terms of the Premisses: Thus, in our example, the Middle Term, 'renders the surrounding bodies visible,' is excluded the Conclusion; and the Conclusion, 'the Moon is a Light,' is formed by combining the two different Terms of the Premisses. Order of the terms.

VIII. Now as it was observed, that the Middle Term may be placed differently, either as the Subject in the Major Proposition, and the Predicate in the Minor, as in our example; or as the Subject or Predicate in both Premisses: Three kinds of Syllogisms have been formed, which are called Figures, and in particular, Figure First, Second, and Third, some adding a fourth, wherein the Middle Term is the Predicate in the Major Proposition, and the Subject in the Minor. An example Origin of the syllogistic figures.

ple of the firſt Figure you have above, (§ 6.); of the ſecond is the following;

'Every prudent Man has a regard to 'futurity:
'Some Babblers have no regard to fu- 'turity;
Therefore 'Some Babblers are not pru- 'dent.'

An example in the third Figure is this;

'No Fool has a regard to futurity:
'Some Fools are rich;
Therefore 'Some that are rich have no 'regard to futurity.'

Origin of the ſyllogiſtic modes.

IX. But as Propoſitions are fourfold, either Univerſal Affirmative, and Univerſal Negative, or Particular Affirmative and Particular Negative, (§ 3, 5. c. 3.); ſo in each Figure there are ſeveral ſorts or Modes of Syllogiſm.

General ſyllogiſtic rules.

X. But in order to determine in each Mode the Quantity, that is, the Univerſality and Particularity; and the Quality, or the Affirmation and Negation of Propoſitions, we muſt above all things conſider, that both Premiſſes cannot be Particular, nor at the ſame time both Negative; and therefore, in every Syllogiſm one of the Premiſſes at leaſt muſt be Univerſal, and alſo one at leaſt Affirmative: For we either affirm or deny of ſome partilars of a genus or ſpecies, what we affirm or deny of a whole genus or ſpecies, (§ 2, 3.)

(§ 2, 3.) And hence it appears, that if the Concluſion is Affirmative, both Premiſſes muſt be alſo Affirmative; and if the Concluſion is Negative, only one of the Premiſſes ſhould be Negative.

Infinite propoſition, what.

XI. But it is carefully to be obſerved, that the Minor Propoſition of a Syllogiſm may ſometimes ſeem to be Negative, when in reality it is Affirmative. As for inſtance, if I argue thus;

'No man, who has no regard to futu-
'rity, is prudent;
'Babblers have no regard to futurity:
Therefore, 'Babblers are not prudent.'

The Minor Propoſition here, viz. 'Babblers have no regard to futurity,' ſeems to be Negative. But as the Negation ariſes from the ſubject of the Major Propoſition, and thus affects the Middle Term, and not the *copula*, that denotes the Connection of both Terms in a Propoſition, it is to be conſidered as an Affirmative Propoſition. For it comes to the ſame thing, as if I argued thus:

'Whoever is a perſon, having no regard
'to futurity, is not prudent;
But, 'Every Babbler is a perſon, hav-
'ing no regard to futurity:
Therefore, 'Every Babbler is not pru-
'dent; or, no Babbler is prudent.'

It therefore appears, that the character or mark of thoſe, 'who are not prudent,' is made to conſiſt in, that 'they pay no

regard to futurity,' and that it is affirmed in the Minor Propoſition, that this character belongs to Babblers (§ 4.) Now a Propoſition, ſeemingly Negative, is called *Infinite*.

Rules of the Syllogiſms of the firſt figure.

XII. In the firſt figure the ſubject of the Concluſion, and of the Minor Propoſition is the ſame. (§ 7, 8.) And therefore if in the Minor it can be no otherwiſe connected with the Middle Term than as it ſtands in the Concluſion; in regard this laſt expreſſes what the things are, which are contained under a whole Genus or Species, and to which therefore the ſame thing is to be aſcribed, as is aſcribed to the whole Genus or Species (§ 2, 4.); the Minor muſt neceſſarily be Particular, if the Concluſion is ſuch; but Univerſal, if the Concluſion is ſuch too. In the firſt figure therefore, the Major Propoſition is to be always Univerſal (§ 10.) It is alſo no leſs evident, that in the firſt figure, the Minor muſt be always Affirmative; as it expreſſes, that the ſubject is referred to or contained under the Genus or Species, of which ſomething is Affirmed or Denied in the Major (§ 2, 4.

Four modes in the firſt figure.

XIII. And thus in the Firſt Figure either both premiſſes are Univerſal Affirmative, and conſequently the Concluſion ſuch. Or the Major is Univerſal Negative; the Minor, Univerſal Affirmative, and thus the Concluſion Univerſal Negative: O

the Major is Univerſal Affirmative, the Minor, Particular Affirmative, and then the Concluſion is Particular Affirmative: Or laſtly, the Major is Univerſal Negative, the Minor Particular Affirmative, and then the Concluſion is Particular Negative (§ 10, 12.) And therefore in the Firſt Figure there are four ſpecies or modes of Syllogiſms.

XIV. Now as there can be no Concluſion, but what is either Univerſal or Particular Affirmative or Negative (§ 3, 5. c. 3.), and theſe four Concluſions being made in the Syllogiſtic Modes of the Firſt Figure (§ 13.), all Syllogiſms may be formed in the Firſt Figure. And as it is far from my inclination to trouble beginners with ſuperfluities, eſpecially ſuch as at this day are held in the greateſt contempt; I ſhall entirely omit the Second and Third Figures. Though ſhould a Syllogiſm offer in either of theſe Figures, it will be an eaſy matter, from the Concluſion and Middle Term being given, to form a Syllogiſm in the Firſt Figure, which concludes much more naturally. For inſtance, we concluded above in the Second Figure, Firſt figure ſufficient for all Syllogiſms.

'Every prudent man has a regard to 'futurity;
'Some Babblers have no regard to fu-'turity:
Therefore 'Some Babblers are not pru-'dent.'

This Syllogiſm is directly reduced to the Firſt Figure, if the Middle Term in the Major be transferred from the place of Predicate to that of Subject, as follows:

'No one, who has no regard to futu-
'rity, is prudent;
'Some Babblers have no regard to fu-
'turity:
Therefore, 'Some Babblers are not pru-
'dent.'

Names of the modes of the firſt figure.

XV. But in order to Beginners more diſtinctly ſeeing in what Mode and in what manner, a Syllogiſm muſt be formed, when the Concluſion and Middle Term are given, Names have been allotted to each Mode, from which the quantity and quality of each Propoſition may be ſeen: Namely, the Four Modes of the Syllogiſms of the Firſt Figure have been called, bArbArA, cElArEnt, dArII, fErIO, in which names A denotes an Univerſal Affirmative Propoſition, E an Univerſal Negative, I a Particular Affirmative, O a Particular Negative: All which, for memory ſake, is compriſed in the following verſes:

Aſſerit A, *negat* E, *ſed univerſaliter ambæ.*
Aſſerit I, *negat* O, *ſed particulariter ambæ.*

Examples.

XVI. In order the better to underſtand all this, I here ſubjoin the following examples.

I.

I.

bAr ‘ All men are mortal ;
bA ‘ All learned men are men :
rA Therefore, ‘ All learned men are ‘ mortal.’

II.

cE ‘ None, whoſe underſtanding is li- ‘ mited, is omniſcient ;
lA ‘ Every man’s underſtanding is li- ‘ mited :
rEnt Therefore, ‘ No man is omniſcient.’

III.

dA ‘ Whoever, ſpeaks well of every one, ‘ has many friends ;
rI ‘ Some men ſpeak well of every one :
I Therefore, ‘ Some men have many ‘ friends.’

IV.

fE ‘ None, who indulges his paſſions, ‘ loves virtue ;
rI ‘ Some indulge their paſſions :
O Therefore, ‘ Some men love not vir- ‘ tue.’

XVII. If one of the Premiſſes is ſo evident, as not in the leaſt to be called in queſtion ; it is uſually omitted, and a Syllogiſm, thus maimed of one of its Premiſſes, is called an Enthymeme : As for example, in place of the Firſt Syllogiſm (§ 16.), we may reaſon thus : Enthymeme, what.

‘ All learned men are men ;
Therefore, ‘ All learned men are mortal.’

For, the Major Propoſition, viz. 'All men are mortal,' is ſo evident, that no man can doubt of it. But as the Minor, 'All learned men are men,' is no leſs evident, on omitting that, we may reaſon thus:

'All men are mortal:
Therefore, 'All learned men are mortal.'

Hypothetical ſyllogiſm, what.

XVIII. We ſometimes uſe an Hypothetical Propoſition, as the Major, and then the Syllogiſm is called *hypothetical* or *conditional*: Its two modes are contained unthese general Formulas:

I.

'If A is, B is alſo;
But, 'A is:
Therefore, 'B is alſo.'

II.

'If A is, B is alſo;
But, 'B is not:
Therefore, 'Neither is A.'

For inſtance, in the Firſt Mode, which is uſually called the *Ponens*:

'If all men at times err, Titius may 'alſo err;
But the former is true, viz. 'All men 'at times err:
Therefore alſo the latter, that is, 'Ti- 'tius may, at times, err.'

Namely, what is put in the firſt place as a Condition, under which the other is to be admitted, is called the *Antecedent*; but what is put in virtue thereof in the ſecond

cond place, is called the *Conſequent*. And therefore the rule of the Ponent Mode is, that laying down the Antecedent, the Conſequent is laid down of courſe.

In like manner, in the ſecond mode, called *tollens*, or taking away, we argue thus:

'If the ſtone is not warm, it warms not.'

But the Latter is falſe: Therefore, alſo the Firſt.

Again, 'If Titius loves virtue, he fre-
'quents not bad company.'

Now, the Latter is falſe: Therefore, alſo the Firſt.

The rule therefore of the Tollent mode is; that if the Conſequent is removed, the Antecedent is alſo removed of courſe.

But an Hypothetical Syllogiſm is eaſily reduced to the form of a Categorical one, if we only attend to the Concluſion and the Middle Term. Thus the preceding Syllogiſms are changed into the following.

I.

'All men at times err;
'Titius is a man:
Therefore, 'Titius at times errs.'

II.

'No ſtone, which warms not, is warm;
But, 'This ſtone warms not:
Therefore, 'This ſtone is not warm.'

III.

'Whoever avoids not bad company,
'loves not virtue.;
But, 'Titius avoids not bad company:
Therefore, 'Titius loves not virtue.'

Disjunctive ſyllogiſm, what.

XIX. There are alſo *disjunctive* Syllogiſms, in which the Major is a Disjunctive Propoſition, or ſuch, wherein is affirmed, that one of ſeveral Predicates ſhould be aſcribed to a ſubject, but which ſhould, is left undetermined. Theſe obſerve the following Formulas:

Examples.

I.

'Either A is, or B is;
But, 'A is:
Therefore, 'B is not.

Or,

But, 'B is;
Therefore, 'A is not.'

II.

'Either A is, or B is;
But, 'A is not:
Therefore, 'B is.'

Or,

But, 'B is not;
Therefore, 'A is.'

III.

'Either A is, or B is, or 'C is, &c.

I.

Either the ſoul is a ſimple, or a compound ſubſtance;
But it is a ſimple ſubſtance:
Therefore, not a compound.

Or,

But, it is a compound;
Therefore, not a ſimple.

II.

Either the ſoul is a ſimple, or a compound ſubſtance;
But, it is not a ſimple:
Therefore, a compound ſubſtance.

Or,

But, it is not a compound;
Therefore, a ſimple ſubſtance.

III.

Either the world is produced by an infinite being, or is a ſelf-exiſtent being, or produced by a finite being;

But,

But, ‘ A is:
Therefore, ‘ B and C are ‘ not.’

But, it is produced by an infinite being:
Therefore, neither self-exiſtent, nor produced by a finite being.

IV.

‘ Either A is, or B is, or ‘ C is, &c.
But, ‘ A is not:
Therefore, ‘ Either B is, ‘ or C is, &c.’

IV.

Either the world is a ſelf-exiſtent being, or produced by a finite, or an infinite being;
But, it is not ſelf-exiſtent:
Therefore, produced by an infinite, or a finite being.

V.

‘ Either A is, or B is, or ‘ C is, &c,
But, ‘ A is not, B is not, ‘ &c.
Therefore, ‘ C is.’

V.

Either the world is a ſelf-exiſtent being, or produced by a finite, or an infinite being;
But, it is not a ſelf-exiſtent being, nor produced by a finite being:
Therefore, produced by an infinite being.

The rule is this: If a Disjunctive Propoſition conſiſts of Two Members, on laying down the One, the Other is taken away; and on taking away the One, the Other is laid down. But if it conſiſts of Several Members, on laying down One, the Others are taken away, and the Others being taken away, One is laid down; but One being removed, One of the Others is undeterminately ſet down: Take alſo the following examples:

‘ Peter is either penitent, or perſiſts in ‘ his ſins;

But,

But, 'Peter is penitent:
Therefore, 'Peter perſiſts not in his 'ſins.'
In like manner:
'Either God is unjuſt, or he puniſhes 'blaſphemy;
But, 'God is not unjuſt:
Therefore, 'He puniſhes blaſphemy.'

Disjunctive Syllogiſms may alſo be reduced to Categorical ones, in the Firſt Figure; as in our example:

'Whoever is penitent, perſiſts not in 'his ſins;
'Peter is penitent:
Therefore, 'Peter perſiſts not in his 'ſins.'
Again,
'Whoever is not unjuſt, puniſhes blaſ-'phemy;
'God is not unjuſt:
Therefore, 'God puniſhes blaſphemy.'

Uſe of ſyllogiſms

XX. By theſe Syllogiſms we inveſtigate whatever is diſcoverable by human underſtanding, and demonſtrate to others whatever they want to be convinced of, in order to a manifeſtation of its truth, though we have not always diſtinctly before our eyes, either in inveſtigating, or in demonſtrating, the Syllogiſtic form or method. But whoever duly attends to himſelf, when meditating or demonſtrating, will be abundantly convinced thereof. My writings, both

both mathematical and philoſophical, which I have hitherto publiſhed, and even my experimental Eſſays in Philoſphy, by which I have paved the way to a ſolid knowledge of Nature and Art, are a ſufficient proof of this.

XXI. Let no one imagine, that a proof can be compriſed in a ſingle Syllogiſm: For as we admit the Concluſion, only on account of the Premiſſes, we cannot be aſſured of its Truth, till we are convinced of the Juſtneſs of the Premiſſes. And therefore the Premiſſes are ſo long to be proved by other Syllogiſms, till we come to ſuch a Syllogiſm, as has for its Premiſſes either Definitions, Axioms, clear Principles taken from experience, or Propoſitions previouſly demonſtrated. Nor need we at all times adduce both the Premiſſes, as we may uſe Enthymemes (§ 17.) Mathematicians at times omit the Premiſſes, as the one is brought to memory by the Citation or Reference, and the other by the View of the Figure before them. And thus a *Proof* is a Series of Enthymemes connected together: But Syllogiſms are connected, not only if the Concluſion of the foregoing Syllogiſm be made one of the Premiſſes of the following; but alſo if the Concluſions of ſeveral Syllogiſms are conſidered as a Complex Notion, and thence an Intuitive

Nature of a juſt proof.

tuitive Judgment is formed, which in the following Syllogiſm affords one of the Premiſſes. What we have hitherto ſaid may be illuſtrated by ſuch Geometrical Demonſtrations, as are regularly formed, as may be ſeen in my German Elements of Mathematics, and the Compendium made therefrom. But a Proof is called a *Demonſtration*, if we can ſo far carry on our Syllogiſms, till we obtain in the laſt Syllogiſm nothing but Definitions, Clear Experiences, and other Identical Propoſitions, as Premiſſes. Yet it is to be obſerved, that it is not always neceſſary to carry on a Demonſtration up to its Firſt Principles, ſufficient that we aſſume no Premiſs, which was not before deduced from theſe Firſt Principles. But as very few are rightly apprized of the Majeſty of this Term; ſuch are guilty of Leſe-majeſty againſt it, who would paſs upon the world their crude, imperfect notions, in which uncertainty and obſcurity equally predominate, as genuine Demonſtrations. Nor are we to imagine, that an unuſual meaning is appropriated to this Term, *Demonſtration*, at leaſt out of the province of Mathematics. For all unanimouſly agree, that a Demonſtration is a Proof, which leaves no manner of doubt in the mind. And therefore no Principles are to be aſſumed,

Demonſtration, what.

of

of whoſe certainty we are not fully aſſured. But we have no other evident Principles, but Definitions, Clear Experiences, and Identical Propoſitions, or Propoſitions duly drawn from theſe. And every one muſt allow, that Syllogiſms, vicious in their Matter or Form, can never yield true Propoſitions.

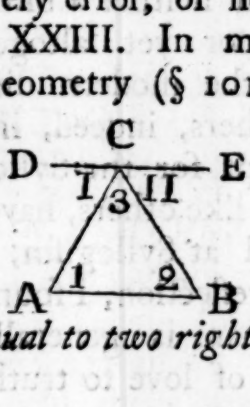
Syllogiſms, why commended.

XXII. Some perhaps may wonder, why I ſhould cry up ſo much the uſual Syllogiſtic method, as a thing at this day in the greateſt diſrepute with every one. Let ſuch know, that I am neither a blind admirer of antiquity, nor yet altogether unacquainted with the modern diſcoveries; that my Teachers, indeed, inſpired me with a contempt for the Syllogiſtic manner, and that I, like others, have, in my ignorance, laughed at Syllogiſm, I own; but, upon maturer reflection, I found the matter otherwiſe than is generally thought; and now, out of love to truth, I ſcruple not, with others, who are great Men, openly to avow that, which is now exploded from ignorance and ſimplicity, by thoſe who never examined the matter with ſufficient penetration. I will not now affirm, with ſome men of great depth of judgment, that the *barbara, celarent*, the ſubject of ſo much ridicule, exhibit a Specimen of the moſt perfect Science *;

ence*; as theſe are things that exceed by much the capacity both of thoſe againſt whom, and of thoſe for whom, I write: Only I will ſhew by Examples, (1) That geometrical Demonſtrations, when duly examined, are reſolvable into formal Syllogiſms. (2) That nothing is diſcovered in Mathematics, but by means of ſuch Syllogiſms. (3) That in the other Diſciplines we can never come to genuine Demonſtrations, but by the ſame Syllogiſtic method. (4) That by it we obviate every error, of never ſo ſubtle a nature.

Geometrical demonſtration made by formal ſyllogiſms

XXIII. In my German Elements of Geometry (§ 101.) is the following Theorem, with its Demonſtration. Namely, *in every Triangle* A B C, *all the three Angles are together equal to two right Angles.*



Demonſtration.

Through the Vertex C of the Triangle draw the Right Line D E parallel to the Baſe

* This Science conſiſts in Separating the Objects from their Images, and by an Apt Combination of Signs repreſenting them diſtinctly to the mind: Examples of which occur in Algebra; and this is ſtill one of the *Deſiderata* in the other Sciences. I ſay more about it (Met. § 324.)

Baſe A B; then will 1 = I, and 2 = II, (Geom. § 97.) Now I + 3 + II = two Right Angles, (ibid. § 59.) Conſequently 1 + 3 + 2 = two Right Angles. *Q. e. d.* Now in order diſtinctly to conceive this Demonſtration, to a full conviction of its truth, let it be actually reſolved into formal Syllogiſms. For from the Figure it appears, that the Angles I and 1 are alternate between the Parallels A B and D E. In conſequence of the Reference § 79 we aſſume, that all Alternate Angles, between Parallels, are Equal: And hence we gather, that the Angles I and 1 are alſo mutually equal. This is the firſt Formal Syllogiſm; which every one muſt conceive, who from conviction is to admit, that the Angles I and 1 are mutually equal. In the ſame manner we again proceed, on viewing the Figure, to form this Intuitive Judgment, that the Angles II and 2 are Alternate between Parallels, and from § 97, aſſume again, that all Alternate Angles between Parallels are mutually equal: And hence gather, that the Angles II and 2 are mutually equal: Here you have the ſecond Formal Syllogiſm, which whoever would be convinced, that the Angles II and 2 are mutually equal, ought to carry in his mind. On a farther view of the Figure, we form this other Intuitive Judgment, that the Angles I, 3 and II ſtand on the ſame Right

Line

Line D E, and at the ſame Point C therein. The Reference § 59 inſinuates, that all the Angles ſtanding on the ſame Right Line at the ſame Point therein, are equal to two Right Angles: Whence we collect, that the Angles I, 3 and II are together equal to two Right Angles. And here we have the third Formal Syllogiſm, which whoever would be convinced, that the Angles I, 3 and II are together equal to two Right Angles, muſt ſtill carry in his mind. Upon turning our eyes to what has been demonſtrated, we obſerve, that the Angles 1 and I, as alſo 2 and II are mutually equal. In conſequence of the common notion of Equality, we muſt then allow, that Equal Angles may very ſafely be ſubſtituted for each other. Hence we infer, that the Angle 1 may be ſubſtituted for the Angle I, and the Angle 2 for the Angle II, without any detriment to the Quantity of either, that is to ſay, it is juſt the ſame thing as if no ſuch Subſtitution were made, as cauſing no Alteration in the Quantity of theſe Angles; and therefore we ſee, that upon making this Subſtitution, the Angles 1, 3 and 2 muſt be ſtill Equal to two Right Angles. And here we have the fourth Formal Syllogiſm, which he, who would be convinced, that the Angles 1, 2 and 3 are together Equal to two Right Angles, ought to have in his thoughts.

The

The Demonſtration thus conſiſts of four Formal Syllogiſms, but their Premiſſes are omitted, as they are brought to mind, either by the references, or by a view of the Figure, or by conſidering what has been already demonſtrated. I would therefore aſk any conſcientious Perſon, who ſpeaks as he thinks, whether he can well omit any of the Premiſſes, if he wants to have a full and diſtinct Demonſtration? Whoever attends to his own thoughts, will plainly find, that he has recalled to mind every one of the Premiſſes, whereof each Formal Syllogiſm conſiſts, although he puts the Minor Propoſition in the firſt, and the Major in the laſt place. And when at any time he happens not ſo diſtinctly to conſider ſome one of the Premiſſes; yet upon a cloſer attention he will find, that he had a confuſed notion of it, as appears from what we have taught (§ 13. c. 1.) concerning the difference between a diſtinct and a confuſed notion.

Uſe of ſyllogiſm in diſcovering truth.

XXIV. Now I foreſee it will be alledged by the Sneerers at Syllogiſms, that it is impoſſible to diſcover any thing by their means, as the Concluſion, which I am to find, muſt be known, before ever I can form the Syllogiſm. That which therefore is to be found, muſt be known, before it can be found, which is manifeſtly abſurd. But does not the formation of Syllogiſms,

delivered above (§ 1, 3.), and daily experience, even that of the Vulgar (Met. § 334.) plainly ſhew, that we firſt know the Premiſſes, and that they may come together into our minds, before ever we have thought of the Concluſion? I will not now mention that the whole of the Algebraical Calculus, by means of which ſo many diſcoveries are at this day made in the Mathematics and their kindred Sciences, is performed by pure, Formal Syllogiſms; but only ſhew the manner, in which the above geometrical Theorem was diſcovered by means of ſuch Syllogiſms. For ſuppoſe, I want to know the quantity of the three Angles 1, 2, 3 of a Triangle, taken together. The art of invention brings to my mind, that the quantity of the unknown Angles muſt be determined by a compariſon with Angles of known quantities. In conſequence of my purpoſe, it appears that the quantity of the Angles 1, 2, 3 is unknown. Whence I gather, that the quantity of the Angles 1, 2, 3, taken together, is to be determined by a compariſon with Angles of a given or known quantity. But now, when I recollect that Parallel Lines give Angles mutually equal, I am led by the foregoing Syllogiſm to draw through the Vertex C of the Triangle the Line D E parallel to the Baſe A B. In this manner I open to myſelf a way to

 othe

other Syllogiſms. The Figure ſhews me, that 1 and I are alternate Angles between Parallels. The Term, *Alternate Angle*, brings to my thoughts, that all alternate Angles between Parallels are mutually equal. From theſe Premiſſes, which I know, without once reflecting on the Concluſion, I conclude, that the Angles I and 1 are mutually equal. In the ſame manner I alſo find, that the Angles II and 2 are mutually equal. The Figure farther ſhews, that the Angles I, 3, II ſtand at the point C on the Line D E. This brings to memory, that all Angles, that ſtand at the ſame point on a Right Line, make 180° or two Right Angles. And thus I conclude, that the Angles I, 3, and II make 180°. And now I ſee from what I have already found, that the Angles I and 1, as alſo II and 2, are mutually equal. And the Term *Equal*, reminds me, that equal Angles may be ſubſtituted for each other, without affecting or altering their quantity. And therefore I conclude, that the Angle 1 may be put for I, and 2 for II. This done, it comes out, that the three Angles, 1, 2, 3 in the Triangle make together 180°. Who then will venture to deny, that both Premiſſes may be known before the Concluſion, and that both of them may occur, in order to infer thence the Concluſion (§ 7.)? Conſequently For-

mal Syllogiſms are in every reſpect a means of diſcovering truth. And if we are upon our guard here not to make a falſe ſtep, it is not poſſible we ſhould fall into Error. But that the ſame method may be purſued in other branches, beſides the Mathematics, will appear from the two following Chapters.

Syllogiſtic method applicable in other branches of knowledge.

XXV. I am now to ſhew in what manner Formal Syllogiſms lead to demonſtrations in other branches of knowledge beſides the Mathematics. For inſtance, I am to ſhew, in the Geometrical method, that Air has an elaſtic force; this Propoſition I have learned from experience: Namely, if I tie up cloſe a little Air in a bladder, to prevent its eſcape, and hang it under a glaſs Receiver, and pump away the external Air; the Air in the Bladder becomes expanded, as if more Air was blown into it. I no ſooner bring the Demonſtration of this into Formal Syllogiſms, than I ſee, that it may be reduced to the form of a Geometrical Demonſtration. This Experiment furniſhes the following Syllogiſm:

'That which begins to Expand, on re-
'moving the Reſiſtance, has an Ex-
'panſive or Elaſtic Force;
'The Air begins to Expand, on remov-
'ing the Reſiſtance:
Therefore, 'It has an Expanſive Force.'

The

The Major Propoſition muſt be proved by a new Syllogiſm, whoſe middle Term is the Definition of Elaſtic Force. Namely, we call an Elaſtic Force the continual endeavour or effort of Expanſion, and therefore we conclude farther thus:

'That which exerts a continual endeavour or effort of Expanſion, has an 'Elaſtic Force;

'That which begins to Expand, on removing the Reſiſtance, exerts a continual endeavour of Expanſion:

Therefore, 'Whatever begins to Expand, on removing the Reſiſtance, 'has an Elaſtic Force.'

The Major is a Definition, and is thus no farther Demonſtrable: The Minor, indeed, admits of a farther Demonſtration: Yet as it is ſufficiently known from experience, and the proof would be too tedious, we may, after the example of *Euclid*, aſſume it as an Axiom without Proof.

The Minor of the Firſt Syllogiſm, namely, 'that the Air, on removing the Reſiſtance, Expands,' is proved by this other Syllogiſm, viz.

'Whatever Expands a Bladder, upon 'removing the Reſiſtance, is itſelf 'Expanſive;

But, 'The Air Expands the Bladder, 'on removing the Reſiſtance:

Therefore, 'The Air, on removing the 'Reſiſtance, is Expanſive.'

The Major, as in the foregoing Syllogiſm may, after the manner of *Euclid*, be aſſumed as an Axiom without proof. The Minor is an Intuitive Judgment drawn from experience. We have therefore all the materials or requiſites for a Mathematical Demonſtration. And therefore by the intervention of theſe Syllogiſms, the whole may be propoſed in the following manner.

DEFINITION.

1. The *Elaſtic Force* is a continual endeavour or effort of Expanſion.

SCHOLION.

2. *If a Sword is bent, a continual endeavour of unbending or recovering itſelf may be perceived by the touch. On account of this endeavour we aſcribe thereto an Elaſtic Force.*

AXIOM 1.

3. Whatever is Expanſive, on removing the Reſiſtance, exerts a continual effort of Expanſion.

SCHOLION.

4. *This appears from the inſtance of the Sword* (§ 2.)

AXIOM 2.

5. Whatever Expands a Bladder, on removing the Reſiſtance, does itſelf Expand, on removing the ſame Reſiſtance.

EXPE-

EXPERIMENT.

6. If a little Air be left in a Bladder, bound tight to prevent the eſcape of any part of it, and then hung under a glaſs bell or receiver, and the external Air be pumped away; the internal Air Expands the Bladder.

COROLLARY.

7. As the internal Air Expands the Bladder, on pumping the external, this laſt muſt hinder the internal from Expanding the Bladder: Conſequently the internal Air Expands the Bladder, as ſoon as the Reſiſtance is taken away.

THEOREM.

8. *Air has an Elaſtic or Expanſive Force.*

DEMONSTRATION.

Air Expands a Bladder, in which it is included, directly on taking away the Reſiſtance (§ 7.), conſequently itſelf is Expanded within (§ 5.) Now as Air exerts a continual effort of Expanſion (§ 3.) it has therefore an Elaſtic Force (§ 1.) Q. E. D.

As in all the parts of Philoſophy I demonſtrate from juſt definitions and experiences, or intuitive judgments, the Propoſitions I maintain, in one connected chain of reaſoning, any one who inclines to exerciſe himſelf in Demonſtration, may with the greateſt eaſe reduce many more examples to the ſame form.

Errors refuted by formal syllogiſms

XXVI. In fine, that by means of Formal Syllogiſms, any error may be diſcovered and obviated very eaſily, and wherein it conſiſts plainly ſhewn. For, on reducing the Demonſtration to Formal Syllogiſms, I preſently ſee, whether a Concluſion is juſt or no; whether ſome Propoſition is aſſumed without proof, which ought not to paſs unproved; whether the Terms are diſtinctly defined; and whether the Experience, or Intuitive Judgment, is well grounded.

Syllogiſms, why not to be uſed in a diſcourſe.

XXVII. But though I commend the uſe of Formal Syllogiſms, yet my meaning on no account is to have them ſet down regularly on all occaſions one after another. This has too much the air of pedantry: Sufficient, that nothing is adduced, but what is concluded in due form: The Premiſſes may be omitted at pleaſure, provided we know, there is ſomething in our diſcourſe, whereby they may be brought to the Reader's memory; as the example (§ 25.) abundantly ſhews, on conſidering that Demonſtration, as formed from antecedent Syllogiſms.

Cryptical ſyllogiſms

XXVIII. At times we meet with *Cryptical* Syllogiſms, or ſuch whoſe form is diſguiſed, which either ſeem to have no form at all, or to claſh with the rules of Syllogiſms (§ 10, 12.) As the following:

‹ Virtue

'Virtue is commendable;
'Taciturnity is rightly deemed a virtue:
Therefore, 'Taciturnity is commenda-
'ble.'

We eaſily ſee, that in the Minor and Concluſion, equivalent Terms are ſubſtituted for ſuch as the ſtrict Syllogiſtic Form requires, and that this diſguiſed Syllogiſm is equivalent to the following, which is in due form, viz.

'Virtue is commendable;
'Taciturnity is a virtue:
Therefore, 'Taciturnity is commenda-
'ble.'

This other Syllogiſm is alſo an inſtance of the *Cryptical* ſpecies.

'Virtue is the habit of promoting our
'happineſs;
'Temperance is the habit of promoting
'our happineſs:
Therefore, 'Temperance is a virtue.'

Which is equivalent to the following, viz.

'Every habit of promoting our happi-
'neſs is a virtue;
'Temperance is a habit of promoting
'our happineſs:
Therefore, 'Temperance is a virtue.'

There are ſeveral ſpecies of Cryptical Syllogiſms, which any one, practiced in the Syllogiſtic method, can eaſily diſtinguiſh, when reduced to due form.

XXIX.

Immediate conſequences.

XXIX. We ſometimes ſeem to draw a Concluſion from a ſingle Premiſs; which manner of reaſoning is called *an immediate Conſequence*. As if I ſay,

'A Triangle is a figure;
Therefore, 'Whoever deſcribes a Tri-
'angle, deſcribes a figure.'

Here it ſhould ſeem, as if I immediately drew one Propoſition from another. But it is evident, that the one of theſe Propoſitions alone cannot poſſibly lead me to the other. For that purpoſe it would be neceſſary, the Firſt ſhould directly excite the Second in my mind: But that is by no means the caſe. This appears ſtill more evidently in other inſtances. For example, if I ſay,

'Every Animal perceives;
Therefore, 'Some Animals perceive.'

This in fact is an Enthymeme, in which the Minor, viz. *Some Animals are Animals*, is omitted. And here, in paſſing, I obſerve, that the Propoſition omitted is Identical (§ 13. c. 3.); and thus it appears, that the uſe of Identical Propoſitions are unavoidable in Syllogiſms. Whoever attempts to reduce Demonſtrations to Formal Syllogiſms, will have many ſuch examples, both in Mathematics and the other Sciences. But in order to avoid a diſpute about Words we hint, that then one Propoſition follows from another, if it occurs

to

to the mind directly on hearing, or only thinking on the other. Of such immediate consequences I treat at greater length in *My Thoughts on God, the World, and the Soul of Man* (Met. § 354 seqq.), and still more circumstantially in my Logic in Latin (§ 454 seqq.)

OF

OF EXPERIENCE.

CHAP. V.

Concerning EXPERIENCE, *and the Manner of Inveſtigating Propoſitions thereby.*

Experience, what.

I. WE Experience whatever thing we know, when we attend to our Perceptions. For inſtance, a lighted Candle makes every thing about us Viſible; Water ſpilt Wets the table; the Flame of a candle Burns paper, &c. All ſuch knowledge is called *Experience*. A Judgment formed in conſequence of ſuch Experience, I call *Intuitive*, to diſtinguiſh it from that other, to which we come by means of Syllogiſm, and which I call *Diſcurſive*.

Our duty, on appealing to experience.

II. Now as we only Perceive ſingular or individual things, Experiences are alſo nothing other but Propoſitions drawn from ſuch. And therefore whoever appeals to Experience, is juſtly bound to adduce a parti-

particular caſe, unleſs the Experience be of ſuch a nature, that every one may directly have the ſame, whenever he pleaſes, or at leaſt can ſoon recollect ſuch a caſe, as having himſelf repeatedly had it formerly. And we require this on two accounts. (1.) In order to know, what Perceptions they were, which the Experience procured. (2.) In order to ſee in what manner a perſon, in conſequence of his Experience, forms his Propoſition or Judgment. And this is extremely neceſſary, for we find that people often contradict each other, and yet all of them appeal to Experience.

III. I will explain this by examples. If one ſhould ſay, he has learned from Experience, that Air is Heavy; the Perceptions ſuch a one has had, on his perceiving the Weight of the Air, are not directly ſo clear to every one. And therefore it is neceſſary, that he adduce a particular caſe, in which he perceived the Weight of the Air; as ſuppoſe, by means of the Air-pump he had diſcharged in the moſt careful manner of its Air a large glaſs or copper Ball, after having weighed it on a Steel-yard, and that he found a conſiderable difference in its Weight. For this is, properly ſpeaking, the Experience; from which the Propoſition, *the Air is Heavy*, is deduced. On the contrary, when from Experience one aſſumes, Explication by example.

aſſumes, that Water, poured out, Wets a Table; it would be needleſs to adduce a particular inſtance for this. For being a thing which happens every day, there is ſcarcely any one, who has not often had this Experience. And ſhould there be any who never had, he need only pour out a little Water on a Table, and be convinced.

How to diſtinguiſh experience from the propoſitions deduced therefrom

IV. From this Example it appears, that the Propoſitions derived from Experience are not with care enough diſtinguiſhed from it, but very often the one is put for the other. And even thoſe who mutually contradict each other, and appeal to Experience, oppoſe not their Experience, but the Propoſitions drawn therefrom, to each other; which ought not to be. For that a perſon has had ſuch and ſuch Perceptions, can only be proved by Witneſſes, if any happened to be preſent, and then he juſtly claims our belief; but he cannot challenge any, that he has reaſoned juſtly; for this is to be judged of by Syllogiſtic Rules; as there is nothing more frequent than ſurreptitiouſly to foiſt in a Propoſition as drawn from Experience, of which an inſtance (Met. § 529.), is given, as imagining we Experienced what we actually did not.

Different caſes of experience.

V. We perceive either the things themſelves and their Properties, or the Changes they undergo, or the Effects of their Action

tion on other things. In the firſt caſe we form either notions of the things Perceived, as was ſhewn above (§ 5, ſeqq. c. 1.), or Propoſitions concerning their properties, as that *Air is Elaſtic*. In the ſecond caſe, we gain Propoſitions, relative to the changes which may befal a thing, as that Air admits of Expanſion by Heat: Laſtly in the third place, we obtain Propoſitions relative to the Powers, which one thing exerts on another, as that the Air firmly compreſſes together exhauſted Hemiſpheres. And in this manner (§ 1.) are formed Intuitive Judgments.

How to know the properties of things.

VI. By *Attributes* or Properties I mean whatever has its Ground or Reaſon in the Eſſence of a thing, or agrees thereto, becauſe it has this Eſſence, or this Definition. As for example, it is a Property of the Triangle, to have three Angles. For this agrees thereto, becauſe a Triangle is a Space or Figure, contained under three Lines. And hence it is evident, that a thing muſt retain its Attributes or Properties, ſo long as it remains what it is, or its Eſſence remains. And therefore, not to reckon as Attributes of a thing, what are far from being ſuch, we muſt deviſe means, whereby rightly to diſtinguiſh them. And this is done various ways. In the firſt place, we are here to repeat what was inculcated about Nominal Defini-

Definitions (§ 42. c. 1.): Namely, that it is ſometimes in our power, to remove the things, whoſe Attributes we would know, from the things around them, and convey them to the neighbourhood of quite different things. And upon this we may learn, whether the reaſon why ſomething agrees to a thing, be extrinſic to it or no. For inſtance, I find a piece of Wax in the Sun, or otherwiſe lying in a warm place, that is become ſoft. I ſuppoſe myſelf ſtill ignorant, whether Wax is at all times ſoft or not: I take and lay it in a cold Place, as a Cellar, and there, I find, it turns hard. And here I recollect, that whatever is not conſtantly in a thing, can be no Attribute, and from it I conclude (§ 42. c. 1.), that Softneſs is no Attribute of Wax: And therefore when ſoft, the reaſon is to be looked for in other things, which happen to be contiguous, as in our caſe, the Sun's rays, to which it was expoſed. On the contrary, I may convey a Stone whitherſoever I will, and it ſtill remains hard, as long as it remains a Stone, or retains its Eſſence. Now as it conſtantly retains its Hardneſs, and I at the ſame time recollect, that what conſtantly agrees to a thing is an Attribute of that thing; I conclude, that Hardneſs is an Attribute of Stone (§ cit.)

VII.

VII. If it is not in our power to move a thing from one place to another; we are to obſerve, whether at another time, when placed in other circumſtances, it ſtill continues to have what it had before. As for example, if we obſerve the Riſing and Setting Sun to be Oval, we are to wait till it comes to a greater Altitude above the Horizon, and then it loſes its Oval, and conſtantly retains its Round Figure. From this I conclude, that the Oval Figure of the Sun at the Horizon, is not proper or peculiar to it. For at the time it appears in our Horizon, it is elſewhere ſeen Vertical, and when come nearer to our Vertex or Zenith, it is in the Horizon of other places, as is ſufficiently evident from Geography. Juſt ſo it holds, when I find Wax Soft in a Warm Air, and at another time Hard, in a Cold. Second way.

VIII. We may alſo determine the matter by Ratiocination; namely from Diſtinct Notions both of the Attribute in queſtion, and of the Matters contiguous to the thing. (§ 19, c. 1.) For on comparing together theſe Notions, I can eaſily ſee, whether the Contiguous things contribute any thing or no; and can find, whether the Ground or Reaſon, why Something agrees with a Thing, be in the Thing itſelf, or in the Things without it. And often we need only get a diſtinct Notion of the Attribute, Third way.

and the Thing whereof it is an Attribute, and we directly procure what we want. As for example, I find, that Wood admits of Splitting. Now I conſider, what is *Splitting*; namely if I force a Knife or Wedge lengthwiſe into Wood, the Wood parts to a greater diſtance than the Knife or Wedge is forced in. Now again, if I conſider the Wood, I find, that it conſiſts of Fibres put together lengthwiſe. And then I preſently ſee, that the Reaſon, why Wood admits of Splitting, is to be found in the Wood itſelf, and conſequently this is an Attribute of Wood. Generally it requires no great degree of reflection to determine the matter, as we preſently ſee, that the reaſon, why Something agrees with a Thing, is not in the Contiguous Things. Such, for inſtance, is the Gravity of Bodies, and the Elaſticity of Air. Of both we know, that other External Things, that ſtrike the Senſes at the ſame time, contribute nothing thereto. Yet caſes may happen, in which the uſe of theſe rules is indiſpenſable.

When we may be ſaid to experience the cauſes of changes.

IX. If one thing cauſes a Change in another, and this Change happens ſo ſoon as the one approaches the other, or one Body is mixed with another, there can be no doubt, but the one is the cauſe of the Change in the other. As for example, if in hot Summer Weather a piece of Wax, lying

lying in the Sun, begins to melt, no doubt remains, but the Sun has melted the Wax. Again, if I mix Oil of Vitriol with Water, and throw Steel Filings therein, and the Filings begin to diſſolve, to throw up Bubbles, and to emit a Sulphurous Fume; there is not the leaſt doubt, but the Oil of Vitriol cauſes theſe Changes in the Steel Filings. Juſt ſo, if *Caius* relates ſomething in a public company, and *Titius* directly changes countenance, as one in a paſſion; there is no doubt, but *Caius*'s words were the occaſion of *Titius*'s diſcompoſure. And thus alſo it is we know, that Air expands by Heat (Experim. T. 1. § 133), that the Plunger, or little Man, called Deſcartes' little Devil, ſinks or plunges in Water (Experim. T. 2. § 17.)

Precaution, to be here uſed.

X. But now in order to be aſſured, whether a certain Thing be the cauſe of the Changes happening in another; we muſt diligently enquire, whether poſſibly either one, or even both together, have already undergone any Change, without which the other would never happen; and alſo whether ſomething beſides might not contribute to the Change. I will adduce an example drawn from my own Experience: It is a thing well known, that on throwing Raſpings of Braſil Wood into Water, a fine Red Colour is ſtruck: But as I happened to take a Glaſs, in which ſome time

before Steel Filings were diſſolved in Oil of Vitriol; on reinſing it with pure Water, I then poured in freſh, and threw in Raſpings of Braſil Wood; when not a Red, but almoſt a Violet-blue was ſtruck. And thus there happened here an uncommon Change in the Water, as it had before undergone ſome Change, by attracting ſome of the Particles of the Steel Filings, diſſolved by the Oil of Vitriol, which had adhered to the Glaſs. Juſt ſo it may happen, that *Titius* becomes diſcompoſed at the Diſcourſe of *Caius*; either as entertaining ſome previous diſguſt in his mind, and thence more apt to take fire than he otherwiſe would, or as ſome one happens to be preſent, who he chuſes ſhould not know what *Caius* relates; or from ſome other Cauſe. And therefore it is neceſſary carefully to examine the ſtate of the thing; which is done various ways, for which the Particular Circumſtances in each caſe, will eaſily ſupply the means to a perſon of reflection. Nor are we to neglect meaſuring exactly both the Powers of the Cauſes, from which the Changes, or Efforts ariſe, and alſo the Quantity of the Changes; but this is the province only of perſons greatly advanced in Mathematical Knowledge. For, on finding the Effect to correſpond with the Power or Cauſe; there can be no doubt, that the One ariſes from the Other.

Inſtances

Inſtances hereof may be ſeen in my *Elementa Aërometriæ*; as alſo in my *Eſſays on Experimental Philoſophy*, for underſtanding which, Common Arithmetic and the Elements of Geometry are ſufficient.

What is to be concluded from the conſtant exiſtence of things.

XI. At times we obſerve a Change, but the Cauſe is latent: But yet we find, that the Change either conſtantly or very often exiſts with ſomething elſe, or elſe the One ſucceeds the Other. For inſtance, we obſerve all the Changes of the Weather, but the Cauſes thereof do not ſo readily ſtrike our ſenſes. But ſuch as compare the Weather with the Calendar find, that often the ſame ſort of Weather exiſts with the Changes of the Moon, and with certain mutual Aſpects of the Planets. And yet we muſt be upon our guard, and not directly take the One to be the Cauſe of the Other: As for example, I muſt not conclude; One day it rained, the Other day it rained, and To-day it rains: One day ſuch an Aſpect, the Other day ſuch an Aſpect, and To-day ſuch an Aſpect: Therefore the Aſpect is the Cauſe of Rainy Weather. For Two things may conſtantly co-exiſt, either as they have one and the ſame cauſe, or as both often chance to happen together. For inſtance: That Frogs begin again in ſpring to croak, and Trees to bud, are things owing to the ſame cauſe, namely, the Air becoming warm again. Con-

ſequently the croaking of Frogs, and the budding of Trees conſtantly co-exiſt. But who would thence conclude, that Frogs, by their croaking, make the Trees bud? Juſt ſo, the Watchmen are always in the ſtreet, in caſe of fire or murder in the night. But muſt we thence infer, that they are the Cauſe of either? Let it therefore rain a hundred times, and be the Aſpect never ſo much the ſame; it can never by any juſt reaſoning be inferred, that Aſpects are the Cauſe of Rain. Yet if Two things often co-exiſt, and One of them happening, the Other not at the ſame time, though nothing to hinder, the conſequence is juſt, that the One cannot be the Cauſe of the Other. The conſequence is ſtill more eaſy, if a certain Effect happens, though another, ſuppoſed to be its Cauſe, happeneth not: As for example: I plainly ſee, that a certain Aſpect cannot be the Cauſe of a certain Weather, as ſuch happens, though no ſuch, nor any other Aſpect happens.

Caution in experience.

XII. But it is highly neceſſary for every one, who would draw his knowledge from Experience, to write down carefully ſuch Experiences or Obſervations as happen not every day, and examine with attention all their circumſtances. In particular, if at our pleaſure, we bring together or combine things, that otherwiſe of themſelves

would never come together, that is, if we make Experiments; we may be ſo much the more certain, that we have carefully obſerved all the conditions, under which any thing happens, if we repeat our Experiment at ſome other time, or cauſe it to be repeated by others. Inſtances of this you will find in my Experimental Eſſays on Natural Philoſophy.

How to frame experiments.

XIII. If many things concur in an Experiment, it is uſeful to examine at firſt in particular the Properties or Nature of each, then taking Two and Two together, in order to ſee, what will be the Reſult, and laſtly to combine All of them together: And we ſhall find, whether any thing was unneceſſarily aſſigned as a Cauſe of an Effect, and at the ſame time diſcover, what each of them contributed thereto. For inſtance, Gunpowder is prepared of Sulphur, Charcoal and Saltpetre: Now in order to find, whether all Three are neceſſary to the making Gunpowder, and what each of them in particular contributes to the Effect thereof; we are firſt to enquire, in what manner Sulphur, Charcoal and Saltpetre are affected by the Fire: Then I mix Sulphur and Charcoal, Sulphur and Saltpetre, Saltpetre and Charcoal together, and I obſerve the Effects or Reſult of theſe Mixtures. At laſt I take them all Three together, and I find, as I ſhew in my *Elements of Artillery*,

that all Three are abſolutely requiſite to Gunpowder, and that which each of them contributes, to its Effect; namely, the Charcoal takes fire, and melts the Sulphur and Saltpetre; the Flame of the Sulphur cauſes the Saltpetre Damp or Fume to burſt out into Flame; and the Saltpetre ſerves to produce the violent Expanſion or Exploſion of the kindled Gunpowder.

How to avoid the deceptions of ſenſe.

XIV. We are here not to omit, that things are very often other than, or different from, what they appear to us. And therefore we muſt be on our guard, not to judge directly, that things are really ſuch, as they happen to ſtrike our Senſes: For thence have ariſen numerous prejudices and errors, which have checked the progreſs of the Sciences, and have been ſo much the more zealouſly maintained by the Learned, as they imagined, they had Experience in their favour. Thus moſt people imagine, that the Earth is the Centre of the World, and the only habitation for rational creatures; that the Heavens are the Canopy over our heads; and that the Sun and Stars move round us in twenty-four hours; as all this appears to our Eyes. And therefore it is of great ſervice, to learn by what laws the Repreſentations of things are formed in our Senſes: In which view in particular an accurate knowledge of Optics and Aſtronomy is neceſſary. Experimental

mental Philoſophy may alſo greatly contribute thereto, as exhibited in my Eſſays on that Subject.

XV. But though Experiences be in themſelves nothing but Singular or Individual Propoſitions (§ 3.); we may very eaſily change them to Univerſal or General Propoſitions, if we only remark with attention all the Circumſtances, in which a thing happened (§ 5. c. 3.) For all things in Nature act and ſuffer, or produce their Effects, and undergo their Changes, in conſequence of their Eſſence, and of the Circumſtances, in which they happen to be. And hence, while they continue of the ſame Eſſence, and to be in the ſame Circumſtances; they muſt alſo continue to produce the ſame Effects, and undergo the ſame Changes. Thus, if I experience, that Compreſſed Air forces Water out of a certain Fountain; I need not doubt, that if ſuch another Fountain is made, and the Air therein Compreſſed, but the Water will in like manner be forced out. Juſt ſo, if I have once Experienced, that the Aſſurance of a preſent Good produces Joy, I need not doubt in the leaſt, but that a like Aſſurance will in other caſes alſo produce Joy. And ſhould any one raſhly and inconſiderately produce Inſtances to the contrary, it might be preſently ſhewn, either that there was no Conviction or Aſſurance of

Manner of drawing general propoſitions from experience.

of the Present Good, or that it was accompanied with Doubts. Whoever perusses my Experimental Essays, mentioned (§ 12.), will sufficiently perceive, how he may draw General Truths by means of Experience.

OF

OF THE INVESTIGATION OF PROPOSITIONS, &c.

CHAP. VI.

Concerning the INVESTIGATION *of* PROPOSITIONS *from* DEFINITIONS, *and concerning the* SOLUTION *of* PROBLEMS.

I. AXIOMS and Poſtulates are deduced from a Single Definition (§ 13. c. 3.) And therefore here is nothing more requiſite, but that we endeavour to form diſtinct notions of the contents of a Definition, both conſidered in themſelves, and compared together. For example, if I conſider with myſelf the Definition of Joy, that it is *an Affection, ariſing in us when we imagine ourſelves convinced of the poſſeſſion of a preſent good*; we examine the notion of *Conviction* or Perſuaſion, and the notion

Axioms and poſtulates, how found.

notion of *Good*. Now as, for inſtance, I perceive from the Definition, that he, who knows his want of Conviction, has his Joy interrupted; and on reflection, I find, that whoever imagines himſelf Convinced, and really is not, may come to know, that he is ſtill very far from Conviction; I directly infer from the Definition (§ 16. c. 4.) that whoever imagines himſelf Convinced of the enjoyment of a preſent Good, and in reality is not, the Joy of ſuch a one may be interrupted. And thus the following Axiom is clear, That *whoever is not actually Convinced of the enjoyment of a preſent Good, his Joy may be interrupted.* In like manner, the following Poſtulate is evident; that *if one, not actually Convinced of the poſſeſſion of a preſent Good, be made to entertain doubts about it, his Joy may be interrupted.*

Why requiring no demonſtration.

II. Now as every one can directly diſcover the juſtneſs of theſe Propoſitions, on reflecting on the Definition; it is altogether unneceſſary to add a Demonſtration. And therefore we uſually ſay of them, that they require no Demonſtration, being ſelf-evident; namely, ſo ſoon as we underſtand the Definition, whence by means of a Single Syllogiſm they are derived. In other reſpects, it is not to be denied, but that if we were to proceed ſtrictly and in rigour, they admit of a Demonſtration, tho'

not

not a very long one. But were we to obſerve all this accuracy, we ſhould prove diſguſtful and tedious to ſuch as are not particularly, or not at all, converſant in ſtrict Demonſtration; of which Claſs are moſt Readers.

III. Theorems are found out, on comparing ſeveral Definitions together (§ 14. c. 3.) But this only happens, on exhibiting orderly to the mind diſtinct notions both of all the contents of the Definitions, and alſo of whatever we learn either from Experience concerning the things, Definitions of which are given, or from what has been previouſly demonſtrated concerning them. For thus it will appear, what new truth may thence be gathered. As for example: Joy is an Affection, raiſed in us when we imagine ourſelves perſuaded of the Poſſeſſion of a preſent Good: But Grief an Affection, manifeſting itſelf, when we fancy ourſelves convinced of the Senſe of a preſent Evil. From the Definition of Joy, I plainly ſee, that whoever feels Joy, need not be actually convinced of the Poſſeſſion of a preſent Good. And here it occurs, that whoever is not actually convinced of the Enjoyment of a preſent Good, may take Evil for Good. Whence I infer, (§ 16. c. 4.) that whoever feels Joy, may deem a preſent Evil a Good. Now as it farther occurs, that whoever accounts

Theorems, how inveſtigated.

accounts a preſent Evil a Good, may be convinced, that what he takes for a Good, is an Evil; I farther infer, that whoever feels Joy, may be convinced, that what he holds to be a Good, may happen to be an Evil. I then reflect, that whoever is convinced, that he deems an Evil a Good, will feel Grief in conſequence of the Definition of Grief. And thence I draw, that whoever feels Joy, may come to feel Grief. And thus we obtain the following Theorem; That if we can convince a perſon, who feels Joy on account of ſomething, that what he deems a Good is rather to be deemed an Evil, the Joy of ſuch a one may be turned into Grief. But it is not neceſſary, in order to Inveſtigate Theorems, always to begin with Definitions; as we need only aſſume Propoſitions, drawn before either from Definitions, or from Experience. In the ſeveral branches of Philoſophy, which I have publiſhed, I, in this manner, inveſtigate moſt Propoſitions; and whoever peruſes my Mathematical Writings, particularly my Latin Elements of Mathematics, in the manner I direct in my *Ratio Prælectionum*, Sect. I. c. 2. § 38. will there alſo find, how Propoſitions may in this manner be mutually drawn from each other.

IV.

IV. Whoever reſolves to gain a Habit of Inveſtigating Theorems, muſt begin with ſuch Definitions as are not very complex, or ſuch as contain but few Notions, and thoſe ſuch as that the Theorems deduced from them may be directly examined as to their Juſtneſs. For if the contents of Definitions are but few, they are more eaſily ſurveyed, than when more complex. And if we can directly demonſtrate the Juſtneſs of the Propoſitions Inveſtigated, it will appear, whether in the courſe of our Meditation we have formed true Syllogiſms, or reaſoned juſtly. But we ſhall no where find any Definitions, with which theſe Characters agree with more propriety than with thoſe in Arithmetic and Geometry. And therefore ſuch as reſolve to acquire the Practice or Habit of Inveſtigation, ſhould properly begin with both theſe Sciences. Did any one chuſe to peruſe my Latin Elements of Mathematics in the manner directed (§ 3.), and to theſe to add my Philoſophical Works, he would make a more conſiderable progreſs in this practice, than at firſt ſetting out he might be apt to imagine. But every thing muſt take its time, and nothing is to be done with precipitation.

Habit of inveſtigation, how acquired.

V. Whoever would reſolve a Problem, ought to find out in what manner ſomething may be done (§ 12, 14. c. 3.) An Operation therefore, or Effect, or Something

How we come to the ſolution of problems.

thing to be done, is always pre-ſuppoſed to be known. To this knowledge we attain ſeveral ways: For either we aſſume, in conſequence of other thoughts, an Effect as poſſible, though we do not yet certainly know whether it is poſſible or no, but want to find it out firſt; or ſometimes alſo we draw an Effect from other known Truths; or laſtly, we are apprized thereof from Experience.

First method of ſolution.

VI. If we aſſume an Effect at pleaſure, we muſt inveſtigate its Notion, in order to learn whatever is neceſſary thereto. Then we muſt recollect all we otherwiſe know of the ſubject, to the end we may ſee, whether any thing ſhall offer to our thoughts, from which this Effect can poſſibly ariſe. For example, we aſſume in the doctrine of Morality, that a Truſt in God ought to be raiſed in the mind of a certain perſon. Now if I enquire, what is Truſt in God; I find, that it ariſes from a perſuaſion, that God both knows in what manner to help, and that he can and will help. And therefore I recollect all that I know concerning God, and among other things I find, that he is all-knowing and all-wiſe, all-powerful and all-good. And here it occurs, that he who is all-wiſe and all-knowing, knows how to help; he who is all-powerful, can help; and he who is all-good, will help. And thus I thence conclude

clude (§ 16. c. 4.), God knows how to help, and can and will help. From this I plainly ſee, that in order to bring a perſon to truſt in God, we muſt give him a diſtinct notion of God's omniſcience, wiſdom, power and goodneſs, and bring him to a conviction of theſe divine attributes. In the doctrine of Morality and Politics we ſhall have the Solution of many Problems in this manner.

VII. Here we might adduce Mathematical Problems, where, from ſome Numbers aſſumed at pleaſure, or Points and Lines, we inveſtigate others. In which caſes, we inveſtigate diſtinct notions of the given Numbers, and of the nature of the given Points and Lines, or attentively exhibit to our mind what diſtinct knowledge we otherwiſe have of them. For we ſhall either obtain the Solution, or find, that it is not in our power. For inſtance, I want to know, in what manner to find, from the Sum of two Numbers and their Difference given, the Numbers themſelves. Here I conſider, that the Sum ariſes, on adding both Numbers together; but their Difference, on Subtracting the Leſs from the Greater. And thence I farther infer, that thus the Greater Number conſiſts of the Leſs and the Difference; and the Sum conſiſts of Twice the Leſs and Once the Difference. And I directly ſee, that on

Holds principally in mathematics.

Subtracting the Difference from the Sum, twice the leſs remains. Conſequently on Halving what remains, the Leſs Number ariſes: And thus the Solution was found, which is briefly thus: (1) From the Sum ſubtract the Difference. (2) Divide the Remainder by 2, and you get the Leſs Number of thoſe ſought. The Demonſtration lies involved in the Thoughts, which led to this Solution. And therefore, though ſuch Problems are much more eaſily reſolved by Algebra, yet the manner juſt adduced is not entirely to be deſpiſed; both as we can thereby, in the manner of the Ancients, find a Demonſtration of that which is reſolvable by Algebra, and as young Beginners, who want to exerciſe themſelves in the practice of Inveſtigation, may, by ſuch examples, make a good beginning: As I myſelf have formerly with great advantage done, when I firſt engaged in the art of Invention. It is carefully to be remarked, that it is not adviſeable here to conſider the Problems propoſed, as if independent, and without any relation to any others; for ſo we ſhould fall into roundabout ways, and not come at the beſt Solutions. We ſhould therefore begin with the eaſieſt Problems, proceed to the more difficult, and conſider, whether other Problems may not be of ſervice in the preſent. And in this very reſpect the preſent method

thod differs from the Algebraical, in that we conſider the Problems in Algebra out of their connection with, or dependence on, other Problems, or but very few other truths: Whereas in the preſent caſe, we muſt draw forth the Solution by means of a connection with other truths. We therefore make a farther and ſpeedier progreſs in the Algebraical way. The Ancients proceeded in that other way, which I here deſcribe, and hence it is they have not been able to make that progreſs, which the Modern Geometricians have made.

VIII. Whoever reflects on this, and at the ſame time conſiders, what has been adduced above (§ 3.) concerning the Inveſtigation of Theorems, will, without my hinting it, underſtand, that the Solution of ſeveral Problems is drawn from Definitions and Theorems, without our having had any expreſs deſign of finding it: And this is to be the leſs wondered at, as every Problem may with eaſe be converted to a Theorem; on making the Solution the Hypotheſis, and the Enunciation of the Problem, the Theſis, or Poſition, you have directly a Theorem. For inſtance, in the example (§ 7.), ſay, if from the Sum I deduct the Difference, and divide the Remainder by 2, the Reſult is the Leſs Number; and the Problem is thus converted into a Theorem. In the doctrine Second way.

of Morality and Politics I have deduced the Solution of ſeveral, nay of moſt Problems, in this manner. For example, to this head belongs the manner of Amending the Will (Mor. § 373.), which I draw from the Nature of the Will: As alſo what regular method is to be obſerved in Eating and Drinking, which I derive from Principles previouſly proved (ib. 484.): In what manner Children are to be taught the proper method of laying out their money, as inveſtigated from Principles borrowed from Morality (Polit. § 110.) Nay I have in this manner reſolved the general Problem, by which I have inveſtigated all that is taught (Polit. c. 3. part. 1. and c. 3. part. 2.) concerning the Education of Children and the Adminiſtration of a Commonwealth.

Third way.

IX. If we are appriſed of any Operation or Effect of Nature or Art from Experience, either we are preſent when it happens, and attend thereto; or we are preſent and give no Attention; or we are abſent.

How to find the cauſes of effects.

X. In the firſt caſe, we come to know all the Cauſes concurring to an Effect, if all of them ſtrike the Senſes; and only ſome, if ſome only affect the Senſes; but none at all, if none. For example, if a Bladder, with a little Air in it, and bound tight, is held over a Coal-fire, it is blown up with ſuch violence, as at length to burſt.

In

In this caſe, I obſerve with my Eyes all the Cauſes of theſe extraordinary Effects; namely the Coal-fire without, and the Air included in the Bladder. On the contrary, if I hang a Needle on the South Pole of a Magnet, and come near to it with the South Pole of another Magnet, the Needle flies before it, as if blown away with violence, and yet I can obſerve nothing, that drives it away. Now if we perceive with our Senſes no Cauſe at all, either as it happens not to affect them, or that we do not duly attend thereto, or that we have been abſent; we are carefully to conſider the ſtate of the thing previous to, and its ſtate after the change; as thence we may diſcover that which is requiſite to produce the change, and conſequently know thus much at leaſt, that there muſt have been Cauſes, capable of producing ſuch or ſuch Effects. Now if, upon a ſurvey of whatever we know, we happen on things that are capable of producing ſuch Effects, and can alſo prove, that from ſuch alone, at leaſt in the preſent caſe, the Change may have ariſen; we have not only diſcovered the Cauſes, but alſo what they contribute to the Change produced; and thus the Problem is fully reſolved. For inſtance, I obſerve the Needle hanging at firſt at the Magnet directly down or vertical, as the nature of Gravity requires it ſhould. But I

no ſooner approach the other Magnet to it, but it begins to raiſe itſelf up, and to take a poſition inclined to the Horizon. And here I preſently perceive, there muſt be ſomething which raiſes the Needle, and keeps it hanging in the Air, ſo as not to fall back. Now as there is obſervable no ſolid body, to which this Effect can be aſcribed; there muſt be ſome imperceptible flowing or running Stream, which raiſes the Needle, and prevents its falling back to the vertical Poſition: in regard we recollect to have obſerved, that upon letting a ſolid Body hang down by a String in a Stream, the Stream, ſo far as the String permits, carries it down with itſelf. I farther find, that the Needle is driven in an oppoſite direction to the Pole of the approaching Magnet, and thence I gather that a ſubtile Matter, like a Stream, muſt ſhoot out of the Poles of the Magnet with great rapidity, and carry with it the Needle; ſo that the ſhooting of this Stream is ſtronger than the Weight of the Needle, but yet leſs than the Power by which the Needle adheres to the Pole of the other Magnet. In a ſubject of ſome difficulty, I will add a ſtill more eaſy example: A piece of Wax, ſtanding in a Window, is obſerved in a few hours to become flatted, to acquire a ſmooth and even ſurface, and to ſtick faſt to the Window. Now recollecting

lecting from Experience, that melted things run or ſpread in Breadth, acquire a ſmooth even Surface, and retain ſuch their broad Figure and Smoothneſs, and beſides ſtick faſt to rough bodies; and farther recollecting, that Wax melts eaſily, and ſoon hardens again; I preſently diſcover, that the Wax muſt have melted in the Window (§ 16. c. 4.) Now afterwards I found that the mid-day Sun beat ſtrong on the Window, and I reflected that the Window was painted Black. And therefore, as I knew that the Sun beat very ſtrong, and that dark-coloured things ſoon turn warm, I confidently concluded, that the Wax in the Window was melted by the Sun, and that on its going off, the Wax became hard again (§ cit.)

How to find what each cauſe contributes to an effect.

XI. When the Cauſes are inveſtigated, we may farther enquire, what each of them has contributed to the given Effect, either by examining their diſtinct notions, or by recollecting whatever we have known about them, juſt in the ſame manner as we inveſtigate Theorems (§ 3.) For example, if a Glaſs with a narrow neck, filled not quite full with Water, with a little Air left upon the Water; is ſuddenly turned upſide down; at firſt a few Drops will run out, but afterwards not a ſingle Drop. Now we are to inveſtigate how this happens. The Cauſes are, the included Air upon the

Water, the Water contained in the Glaſs, the narrow Aperture of the Glaſs, and the external Air. Of the included Air I recollect, that its elaſtic Force can counterbalance the Weight of the whole Atmoſphere; that when it has free Scope, it expands, and by Expanding, its Elaſticity is diminiſhed. Of the external Air I know, that it cannot force itſelf into a narrow Aperture, at the ſame time that the Liquid runs out, as ſufficiently appears on letting Drops fall from a full ſmall Glaſs Phial. I farther recollect concerning the External Air, that it can ſuſtain Water in a Tube at the height of 32 feet. Now on comparing theſe things together, I find, that the Force of the included Air and the Weight of the Water, taken together, exceed the Weight of the external Air, conſequently the Water muſt fall out. But as a few Drops eſcape, the included Air becomes rarer. Now as in this caſe, its Elaſticity decreaſes, I find ſo much Water muſt remain behind, till its Weight, together with the diminiſhed Elaſticity, become equal to the Weight of the external Air. And as through the narrow Aperture, the Water cannot at the ſame time eſcape, and the Air force in; 'tis impoſſible a ſingle Drop more ſhould eſcape. It would be too tedious, were I to place every thing here in the order a regular meditation requires, wherein one thing follows

lows another in train. Yet when this is done, the uſe of Formal Syllogiſms will plainly appear. Though here it is to be remarked (as I ſhall elſewhere explain more diſtinctly), that as our notions happen to be confuſed, a like confuſion muſt prevail in our Syllogiſtic reaſonings, which moſt people are not always aware of, and hence take confuſed Syllogiſms to be no Formal Syllogiſms.---Whoever wants more examples need only conſult my Eſſays in Experimental Philoſophy. For when I explain, whence every Phenomenon takes its riſe, I proceed in the very ſame manner, which I here preſcribe: Whoever therefore peruſes carefully, and with reflection, theſe Experimental Eſſays, will thereby attain to the habit of putting in practice the Rules given.

Who moſt qualified to inveſtigate truth.

XII. But it is evident from all that has been hitherto ſaid about the Inveſtigation of Truth, that the more extenſive is one's Knowledge, the more qualified he is for Inveſtigation. And therefore Beginners ſhould not directly ſet up for Inventors, but firſt learn, what others have invented before them. Though it is a very uſeful Exerciſe, that, on making the Diſcoveries of others familiar to us, we ſhould examine, in what manner theſe Diſcoveries might poſſibly have been made, according to the Rules preſcribed. And hence it is, that one

one Diſcovery always leads to another: We muſt therefore never look with contempt on the great Men, our Predeceſſors, becauſe poſſibly their Knowledge was ſhort of that of our day. For had they not been our Predeceſſors, we ſhould not have made ſuch advances, as we have. Nay, were we in their place, and they in ours, we perhaps had not come up with, but had fallen very far ſhort of, them. I would adviſe, whoever inclines to exerciſe himſelf in the practice of Reflection and Meditation, not only to examine my Mathematical Writings, both in German, and particularly in Latin, by the Rules given in theſe Six Chapters, but alſo my Philoſophical. We muſt never precipitate, nor be too anxious about the progreſs we make, but leave all to time; nor is it to be imagined, that every thing, which regards Examination and Reflection, is in expreſs Terms contained in my Writings; I barely ſet down as much as is ſufficient to pave the way for farther Advancement.

Corollaries, what.

XIII. We ſometimes ſubjoin to a Definition, or to a Propoſition, of what nature ſoever it be, a particular Caſe to be remarked, or immediately infer ſomething therefrom: And ſuch Inferences are in Mathematics called *Corollaries*. For example, I demonſtrate, that all Affections hinder a man from ſeeing the truth, and thence

thence I conclude; therefore Anger and Revenge have the ſame Effect: And this is a Corollary: And it is alſo a Corollary, if I farther infer; therefore we are not to put into a Paſſion a perſon we want to convince. It is alſo uſual in Mathematics, in which every Species of Truth has its proper name, to reckon among Corollaries, what might well paſs for Theorems, were not the Demonſtration to prove too tedious, and did not the Theorem, to which it is ſubjoined, afford one of the chief Principles for its Demonſtration.

Scholia, what.

XIV. To conclude; In Mathematics occur *Scholia* or Remarks, wherein we ſhew, how Diſcoveries were made; why matters are treated in this, and not in any other order; what uſe the propoſed Truths may be of, their Excellence, &c. but in particular, we farther explain, what might appear to be dark or obſcure. Such Remarks are of great ſervice to the advancement of the Sciences, and it were to be wiſhed, that learned Men were leſs ſparing of ſuch in their Writings.

CHAP.

CHAP. VII.

Concerning SCIENCE, FAITH, OPINIONS *and* ERRORS.

Science, nature of.

I. I HAVE already in the preliminary Diſcourſe (§ 2.) hinted, that by *Science* I mean that habit of the Underſtanding, whereby we prove our Aſſertions, in a manner not to be refuted, from irrefragable Principles. Now as Definitions, Axioms, and clear Experiences, are irrefragable Principles (§ 36. c. 1. § 13. c. 3. § 1. c. 5.), and Demonſtrations carry on a ſeries of Syllogiſms (§ 2, 4. c. 4.) ſo far, till in the laſt Syllogiſm we have only either Definitions, evident Experiences, or Axioms for Premiſſes (§ 21. c. 4.); *Science* therefore is nothing other than a habit of Demonſtration.

Means of attaining to ſcience.

II. And therefore, as the Mathematics are the only Science almoſt in which hitherto ſtrict Demonſtrations have obtained; ſo the ſureſt means to arrive at Science, is the ſerious and indefatigable Application to

to them at firſt, and then, as much as may be, introducing into the other Sciences the Mathematical Method: I ſay on purpoſe, as much as may be: For this Method does not ſucceed in all caſes; and where it does, it carries us to exceſſive Prolixneſs, if we would keep up in all things to the rigour of it. Now as in my ſeveral Philoſophical Writings, I have connected in one continued chain of reaſoning every Propoſition I advance; whoever will apply himſelf with care to peruſe them in due order, according to the Directions given in the ſeveral Prefaces prefixed to each Part, will find in them a ſure Method of arriving at Science.

Faith, what.

III. By *Faith* I underſtand the Aſſent given to any Propoſition on the Teſtimony of another. For example, *Caius* ſays, that *Sempronius* and *Titius* are at variance: If I perſuade myſelf, this is the caſe; I believe it.

Object of.

IV. And thus Faith extends only to things that have happened, or ſhall happen. For other things admit of Demonſtration, and ſo they may be known. But that a thing has happened cannot be demonſtrated: And therefore we muſt truſt to the Teſtimony of another, that is, believe it.

Credulity, how to be avoided.

V. But to obviate Credulity, and the being impoſed on, we muſt in the firſt place

place aſſure ourſelves of two things. (1) That he, who teſtifies any thing, was capable of knowing it thoroughly, ſo as not to deceive himſelf. (2) That he relate the Affair, as he knows it, and have no formed purpoſe to deceive. In a word, we muſt be aſſured, that he is a perſon ſufficiently prudent and ſufficiently upright.

How to know the truth of a teſtimony.

VI. We come to the knowledge of the firſt, if the Witneſs himſelf was preſent at the Tranſaction, gave cloſe Attention to every Particular, is a Perſon of ſuch Abilities as are requiſite to a due Attention, to retain in memory and to relate the Tranſaction; or that what he relates be had from a Witneſs of that Character, and that he is certain that Witneſs had no intention to impoſe upon him.

Cauſes of leſſening credibility.

VII. But as every one may eaſily alter, omit and add ſomething, as experience abundantly ſhews; the Credibility of Teſtimony decreaſes, if it has paſſed through ſeveral hands before it reaches us.

Other cauſes.

VIII. In particular, Credibility decreaſes greatly, if there is a conſiderable interval of time before the Teſtimony reaches us: As in a long ſpace of time, ſomething may very eaſily be forgotten.

Cauſes of falſe teſtimony.

IX. If a Perſon will on purpoſe impoſe a Falſehood on another, there muſt be ſome reaſon for his ſo doing: As it is not poſſible, the Will ſhould be determined by nothing.

thing. Now it is known from experience, that the Will of Man is inclined to do whatever is repreſented to it as good and advantageous; on the contrary is averſe from any thing viewed as evil and hurtful. And therefore if any willingly relates a Falſehood, he muſt do it, either from a view of intereſt, or from a preſumption of averting ſome evil.

Uprightneſs of a witneſs, how explored.

X. But the Intereſt in view may concern either the Soul, the Body, the Character or the Fortune of a Perſon, and be either real or imaginary. The ſame thing holds of the Evil preſumed. We are therefore to examine, whether a Perſon might not in his falſe Relation have an eye to ſome ſuch intereſt, or whether he is not apprehenſive of ſome evil, ſhould he ſpeak the Truth. But it is not to be denied, that, in particular caſes, this is often difficult, nay ſometimes not at all poſſible to find out, as we have not a ſufficient Number of circumſtances, from which to infer this. But this Determination will prove much eaſier, if we happen to be well grounded in the Principles of Morality and Politics.

Farther conſidered.

XI. We are here farther carefully to remark, that a Perſon may hope for a Good, and apprehend an Evil, either from the Perſons, to whom, or from the Perſons, of whom the Relation is made, or from other

other Perſons, related in ſome meaſure to, and having a common intereſt with, both. And therefore, whoever would be on his guard againſt too haſty a Belief, ſhould often weigh all theſe circumſtances, with as much care as poſſible: For which purpoſe again, a good ſhare of knowledge in Morality and Politics is not a little conducive; as therefrom we may, according to the different circumſtances, come to know both the real and the imaginary Intereſts of Men.

A witneſs, when ſuſpicious.

XII. Now if we only apprehend, that a Perſon in his falſe Relation, may have an eye either to a real or an imaginary Intereſt, yet cannot prove his having any ſuch view; there is however at leaſt ſome ground of ſuſpicion, whether poſſibly he might not have foiſted in ſome Untruths with his ſtory.

Suſpicion heightened.

XIII. If we can infer from certain circumſtances, that his having ſuch views is more probable than his not having them; the Suſpicion will be aggravated.

All ſuſpicion when diſappearing.

XIV. On the other hand, if we can ſee no Intereſt, which a Perſon could poſſibly derive from a falſe Relation, and no circumſtances offer, from which we can infer, that at leaſt he imagined to himſelf ſome intereſt; all Suſpicion falls away of courſe.

XV.

XV. But the Credibility of a Relation depends not only on the Authority of the Relater, but often on the Circumſtances thereof. For ſometimes the Circumſtances may ſo claſh, that either we actually perceive, that the Story, as related, could either not happen at all, or not in the manner pretended; or we have at leaſt ſufficient reaſons of Suſpicion. Such Determinations therefore require a good degree of Underſtanding and Sagacity, and an accurate Knowledge of the Circumſtances. Credibility of a relation, how depending on its circumſtances.

XVI. If we frame Definitions, which imply a Contradiction, ſuch as a Rectilineal Two-lined Figure, or account things that differ to be the ſame, or not to differ, and that from Precipitation, not obſerving the Difference; or if in Formal Syllogiſms we aſſume ſuch Propoſitions as Premiſſes, as are impoſſible; or if from juſt Principles we unduly reaſon; in all theſe caſes we deem poſſible, what really is not ſo, and ſo are guilty of an *Error*. Origin of error.

XVII. Whoever therefore would avoid Error, muſt always endeavour to gain Diſtinct Notions, to aſſume no Definition, whoſe Poſſibility he is not fully convinced of, nor admit any Premiſs, of whoſe Juſtneſs he is not previouſly appriſed; as alſo be on his guard in his Reaſonings, not to tranſgreſs the Syllogiſtic Rules. (§ 10, 12, c. 4.) Means to avoid it.

Whence the danger of error ariſes.

XVIII. Whoever proceeds otherwiſe, incurs the danger of Erring, and becomes guilty of Precipitation in Judgment; but yet this is a general Vice of the Learned, and much more ſo of the Learners; which ariſes either from a defect of good rules concerning the right uſe of the Powers of the Underſtanding, or from the neglect to exerciſe themſelves in ſolid Sciences, or from the Impatience of properly guarding their Reaſonings, whether duly Formal and Regular (§ 17.)

Origin of opinions.

XIX. If we aſſume Definitions, which appear poſſible, and in Syllogiſms admit Premiſſes, which have the appearance of Juſtneſs, though we can neither demonſtrate, nor eſtabliſh them from undoubted Principles, we may in all theſe caſes fall into *Opinions*. For example, ſeeing all Bodies are extended in Length, Breadth and Depth, and Extenſion alone ſeems to remain, on abſtracting or preſcinding all the reſt; many People at this day are of Opinion with *Des Cartes*, that the Eſſence of Body conſiſts in Extenſion. But this, as to them, is but an Opinion; for they aſſume, if they abſtract from Body what is proper thereto and not common to all, that Extenſion only remains. But yet they cannot duly prove this Premiſs in their Syllogiſm; it appears only probable, as they ſee nothing beſides, that ſhould at the ſame time

time remain. But what conſequence is this? Where I cannot ſee any thing beſides, there is nothing. In like manner, whatever moſt people have advanced hitherto on the Cauſes of the Alterations in the Barometer, and the Changes of the Weather connected therewith, is nothing but Opinion: Nay, the Generality proceed no farther in the Explication of Nature than to Opinions: And hence *Hartſoecker* re-publiſhed his Principles of Natural Philoſophy under no other Title but that of *Phyſical Conjectures*.

Different degrees of knowledge.

XX. But what is an Opinion to ſome, is not ſo to all; for One may be certain of what appears to Another but probable: And thus he has either the Science, or demonſtrative Knowledge thereof, or he plainly ſees it is an Error. So Perſons of Penetration are aware, that the common Opinion concerning the Eſſence of Body is an Error; for they find, that the power of Reſiſtance is common to all Bodies, which on no account depends on Extenſion (Met. § 655.)

Farther confirmation.

XXI. Again it is poſſible, that ſome may deem bare Opinions to be undoubted Truths; namely, if they neither underſtand the nature of a juſt Demonſtration, nor are duly exerciſed in the practice of Meditation and Reflection, nor employ a ſufficient time in Diſcuſſion. And ſo

we find People, who account it a thing Mathematically demonſtrated, that the Eſſence of Body barely conſiſts in Extenſion, though upon a more accurate examination the contrary is found (§ 20.)

Opinions yield no ſatisfaction.

XXII. Now as we have no demonſtration of Opinions, but aſſume in the proof ſome Propoſitions, which cannot be fully proved, there always remains a fear or ſuſpicion, that the contrary may be true. And thus Opinions yield the mind no compleat ſatisfaction, eſpecially that of an intelligent Perſon, and one ardently deſirous after Truth.

CHAP.

CHAP. VIII.

Concerning the Manner of Eſtimating our own POWERS, *and thoſe of others, as to their Sufficiency for the Inveſtigation and Examination of Truth.*

Eſtimate of the powers neceſſary to inveſtigation.

I. AS we can inveſtigate Nothing from Nothing, but Something muſt always be given, from which Another thing may be deduced; and this laſt is performed according to certain Rules, and preſuppoſes a Habit of Reflection, as appears from all that has been advanced up and down in the foregoing Chapters concerning the Inveſtigation of Truth; ſo it is admitted, that our own Powers, or thoſe of others are ſufficient either to inveſtigate or examine a Truth, if (1) we perfectly well know, whatever is neceſſarily preſuppoſed to be known. (2) If we are acquainted with all the Rules neceſſary for Inveſtigation: And (3) if we have often employed our Thoughts on the Subject. As for example: It is propoſed to contrive a Machine, which is to produce a certain

Effect; this pre-ſuppoſes, that we know not only from Mathematics the Powers of the ſimple Machines, but have alſo acquired compleat Notions of ſeveral more complex Machines, and carefully attended to whatever is requiſite in putting their parts together, both for ſtrength and other purpoſes; and in particular, that we have a diſtinct Notion of their Effects: And one muſt alſo have ſome previous practice in the Invention of Machinery; at leaſt, that if he has acquired a diſtinct Notion of a Machine he has ſeen, he ſhould ſuppoſe, in order to exerciſe himſelf in the buſineſs of Inveſtigation, that the Machine was not yet diſcovered; and then ſhould deviſe the manner, how it might have been found out. Again, in order to decide, whether the human Nature lays any obligation on us to perform certain Actions and to omit certain others, and one wants to determine, whether the Deciſion of this point is in his Power or no; he is then to reflect, whether he perfectly well underſtands the Nature of the Soul, particularly of the Will, and whether he is well acquainted with the Nature of moral Actions and their ſeveral Differences, and has formerly conſidered with deliberation Subjects of the like nature, by the Rules given above. In like manner if it is propoſed to one to determine the difference between the Powers of Nature

ture and of Grace, and to ſet to each their proper Limits; he is carefully to conſider, whether he has ever in a ſolid manner enquired into the Powers of the Soul; and moreover has diſtinctly learned from the Scriptures the Degree of Perfection, to which a man may arrive by means of Grace; and whether he has acquired a habit to form diſtinct Notions, and to propoſe them in a juſt and ſolid Order.

Inveſtigation of truth, whether in our power.

II. It may at times happen, that we are not yet qualified to inveſtigate a Subject, but may ſoon become ſo. Now in order to know this, we are carefully to conſider, in what manner we are to arrive thereto, and what is to be pre-ſuppoſed to the Enquiry; and then attend to ourſelves and our preſent condition and circumſtances, whether we can attain to the known means or not. As for inſtance: The celebrated Mr. *Locke*, whoſe reputation in Germany is no wiſe inconſiderable, has in his work on the Human Underſtanding * pretended, that the Doctrine of Morality admitted of Demonſtration euqally with Geometry, and alſo in his Letters to Mr. *Molyneux*, has more than once repeated, that it might in every reſpect be demonſtrated in the ſame manner as any Geometrical Truth: And to this, Mr. *Leibnitz*, in his Remarks

* Book 3. c. 4. § 7.

on Mr. *Locke*'s Eſſay, agrees. But though Mr. *Molyneux* urged Mr. *Locke* with great earneſtneſs and importunity to undertake ſuch a work; yet he ſeemed to have no great inclination to the taſk. Now ſhould any have a mind to undertake it, and ſhould want to enquire, whether he were already qualified, or could undertake to qualify himſelf; he ought, according to our Rules, to reflect as follows; that whoever would demonſtrate the Doctrine of Morality in a Geometrical manner, muſt be perfectly maſter of the Geometrical method, eſpecially as employed in the Applicatory or Mixt Branches of Geometry, ſuch as Optics, Mechanics and Aſtronomy, and have great practice therein. If therefore he conſiders, that Demonſtration requires every thing to be conſtantly deduced in a connected manner, by means of juſt Syllogiſms, from ſome diſtinct Notions, whoſe Certainty is indiſputed (§ 21. c. 4.); he will ſoon be appriſed, that here the buſineſs depends not barely on Experience or Obſervation, from Converſe with Mankind, or on Hiſtorical Knowledge; but (as we have the Human Will to bend or gain) on diſtinct Notions of the Powers of the Human Soul and their Operations. Now upon finding, that we are entirely unacquainted with the Mathematics and genuine Metaphyſics, which convey the knowledge neceſſary

ceſſary for the purpoſe; we ſhall ſoon perceive our unfitneſs for ſuch a taſk. And if we farther find, that our condition or circumſtances in life will not admit our proceeding ſo far in Mathematical Knowledge, nor to arrive to ſuch an accurate acquaintance with the Soul; either as our other occupations will not allow the time neceſſary for that purpoſe; or as we fail in the patience requiſite to long reflection; or as we know not juſtly, how with profit to meditate on things ſo remote from Senſe; we may be ſufficiently convinced, that we would loſe both time and labour, ſhould we undertake the taſk which *Molyneux* wanted to lay on *Locke*. In like manner theſe Rules may be applied to the examples given (§ 1.)

Whether experience is a thing in our power.

III. Eſpecially if the things which we want to inveſtigate come under the head of Experience; we are carefully to conſider, whether it be in our Power to ſet about the neceſſary Experiments; and whether we are maſters of that dexterity, and of the means neceſſary thereto; which the rules of Experience (§ 5, ſeqq. c. 5.) and the particular circumſtances very eaſily ſupply us with. As for example, we want to know, whether the Fibres of Wood are yearly produced from the Juice aſcending between the Bark and the Wood, or whether they are ſeparated from the reſt of the

Subſtance, and only dilated by the Nutritious Juice. Here we ſee directly, that it is requiſite for this Enquiry, to have ſeveral Trees at our diſpoſal, from which we may, the Year round, as often as we think it neceſſary, cut off Slips; that we be well verſed in the Anatomy of Vegetables; and laſtly, be furniſhed with good Microſcopes, magnifying Objects to any Degree. Whoever has it not in his Power to ſet about ſuch Obſervations, ſhould own his Inability. And the ſame thing we are to obſerve, in the Caſe of diſtinct Notions, which are obtained by Reflection on Objects preſent; as if one were to determine whether he was properly qualified to write a book on Clock-work.

Whether real definitions are in our power.

IV. We may without ſcruple venture on real Definitions, if we find ourſelves qualified to Inveſtigate by means of Anatomy and Microſcopes the Structure of organized Bodies (§ 56. c. 1); or if preſent, we can attend to the Formation of the thing (§ 57. c. 1.) As for inſtance, whoever is furniſhed with good Magnifiers, may diſcover the Nature of the Pith in Trees, the Texture of the Wood, the manner of the Circulation of the Blood, &c. Whoever attends to himſelf on the riſing of an Affection in his breaſt, or on doing a virtuous Action, may diſcover the Nature both of the Affection and of the Virtue, provided he

he has the Ability of Conceiving distinctly what he feels (§ 19. c. 1.) It is probable, that we have it in our Power to form real Definitions, if we not only know the Nominal Definitions, and have distinct Notions of the things contained therein, but also know many other things, particularly kindred Objects, or of Affinity therewith (§ 54. c. 1.), and if we are not unpracticed in the business of Reflection (§ 1.) For example: If I know, that a Tumor is an extraordinary thickness in the fleshy parts of the body; and if I understand the Nature of those parts, and how it is possible, a Body may become thicker than it is; it will afterwards be easy to discover the causes and manner of the Tumor's arising.

Our ability in investigating theorems.

V. If we have learned to reflect, and to form Definitions, we shall have it in our Power to frame Axioms and Postulates (§ 1. c. 6.) If practiced much in Discussions, and furnished with many Definitions, or with Propositions derived from them, we may venture upon investigating Theorems (§ 3. c. 6.)

At resolving problems.

VI. We are qualified for the Resolution of Problems, if we have distinct Notions of the Causes of Effects, and besides know whatever has any Affinity with them (§ 6, 11. c. 6.) And we may hope for success in the Solution, if we have distinct Notions

tions of the ſtate or condition of things, as they ſtood both before and after the Change; and beſides if we know other things, that in particular have ſome affinity therewith (§ 10. c. 6.). The examples exhibited Chap. VI. may ſerve for explanation. But here alſo the gift of Reflection is neceſſary (§ 1.), as alſo neceſſary to have every thing ſo at command, as directly to offer to our mind, juſt when wanted (§ 24. c. 4.)

To form a judgment of the powers or abilities of others.

VII. As we inveſtigate our own Abilities or Powers, juſt ſo we do thoſe of other people: Yet this laſt is often attended with ſome difficulty. For that which we can intuitively know in ourſelves, upon bare Attention, we muſt commonly, in the caſe of others, inveſtigate by Ratiocination, either from their Writings or Diſcourſes, or from what we are told about them by others.

Utility of the rules given.

VIII. But we are to be on our guard, not to miſapply the Rules hitherto given. We have no other view, than that a Perſon ſhould not undertake, with loſs of time, and needleſſly, a taſk, he is unequal to; and that, when deſpairing of ſucceſs, he might be enabled to diſcover the reaſon thereof. But be it far from us directly to deſpair of our Powers, and puſillanimouſly to venture on nothing, wherein difficulties offer, which we know not whether we can

ſurmount

ſurmount or no. But we ſhould rather, till we can plainly ſee we cannot hope to ſucceed, venture upon it, and hold on with diligence and perſeverance, till by means of the general Rules here preſcribed, we find out the particular Reaſons of our Miſcarrying.

CHAP.

CHAP. IX.

Concerning the Manner of paſſing a JUDGMENT *on our own* INVENTIONS *and thoſe of others.*

Claſſes of inventions.

I. AS every thing that can poſſibly be the Objects of our Thoughts, are either Definitions and Deſcriptions (§ 36. c. 1.), or Propoſitions (§ 2, 3. c. 3.), or Experiences (§ 1. c. 5.); and Propoſitions are either Axioms, Theorems or Problems (§ 13, 14. c. 3.); all Inventions may be reduced to theſe Claſſes; and we may, with eaſe, from the Definitions given, judge, to what Claſs an Invention belongs (§ 36. c. 1, and § 1. c. 4.) As for example: If one ſays, Heat is a Collection of ſmall Particles, of ſharp-pointed Figures, and of very quick Motion, we plainly ſee, he wants to give a real Definition of Heat (§ 48. c. 1.) On the contrary, if he ſays, Heat is neceſſary to the Life of Man, we immediately perceive, that this is a Theorem (§ 14. c. 3.) Juſt ſo if I affirm, Honour is an Opinion, which we entertain of the Perfections

fections of another; I directly ſee, that this is a Definition. On the contrary, if one affirms, Honour is not in our Power; we perceive immediately, that this is a Theorem. But if he ſays, that whoever would honour God, muſt have a ſolid Knowledge of his Perfections, and often repreſent them to himſelf; it directly appears, that this is a Solution of a Problem.

Nominal and real definitions confuſed.

II. If we undertake to define the Eſſence of a thing, yet only recite ſome Properties thereof, whereby it is diſtinguiſhed from others ſimilar thereto, we confuſe or blend nominal with real Definitions (§ 41. c. 1.) Thus the Carteſians are under a miſtake, perſuading themſelves, that they have given a Definition of the Eſſence of the Soul, on reciting a Property thereof, calling it a Thinking Subſtance. Juſt ſo are they miſtaken, in imagining, that they have defined the Eſſence of Body, by ſaying, it is a Subſtance extended in Length, Breadth and Depth. And Civilians have ſucceeded no better, when they fancy, that they underſtand the Nature of Obligation, by calling it a Band of Right or Law, whereby we are reſtrained from doing or omitting ſome things.

Who incapable of diſtinguiſhing words from things.

III. Whoever they are that obſerve the Operations or Effects of things, and that from which they ariſe, or their Cauſes, and call them by peculiar Names, and employ theſe

theſe Names inſtead of the Cauſes of Effects, ſuch cannot be ſaid to diſtinguiſh Words from Things. For as, on occaſion of the Word or Term, they can think of nothing but the Effect, the Cauſe of which they want to know, and thus having no Notion of the Cauſe (§ 4. c. 1.), their Word or Term is a mere empty Sound (§ 3. c. 2.) Now as we happen to imagine, that we expreſs the Cauſe, on pronouncing a Word, we muſt neceſſarily be ignorant of the Diſtinction between Words and Things. As for inſtance: The Schoolmen obſerved ſeveral Effects or Phenomena in Plants; as that they are nouriſhed, that they grow, that they generate their like. Now as they were unacquainted with the Anatomy of Plants, they called that Thing from which theſe Effects aroſe, the *Vegetative Soul.* And as many different Effects as they obſerved in Plants, ſo many different Powers they aſcribed to this Soul; ſuch as the faculty of Attracting Juice through the Roots, the faculty of Diſtributing it thro' the Plant for its Nouriſhment, that of Forming new Leaves and Twigs, and little Plants in the Seed. Now on taking away the Notions, which correſpond to the Effects known from Experience, there remains nothing but empty Sounds; and therefore they vended mere Words for Things. But after that *Deſcartes* had happily

pily diſcarded this trumpery or rubbiſh of empty Words, Perſons of underſtanding are at this day aſhamed to aſſign the Soul as a Cauſe of the Effects produced in Plants, in the Bodies of Beaſts and of Men; juſt in the ſame manner, as in the doctrine of Morality, many reaſon on the different Temperaments. And in the old Phyſics we find ſcarce any thing but the occult Qualities of the Schoolmen, which are now juſtly exploded, and reckoned among empty Sounds, which have no meaning. On the contrary, ſuch Perſons ſpeak without Thought, as hold the preeſtabliſhed Harmony to be an empty Sound.

How to judge of notions.

IV. How we are to judge of any Notions propoſed, may be ſeen from Chap. I. But in particular we are carefully to conſider, whether one gives a Notion out as poſſible, before he has proved its Poſſibility (§ 31. ſeqq. c. 1.). Thus the Carteſians aſſume the Notion of God, that he is the moſt perfect Being poſſible, before they have proved its Poſſibility. Whence therefore it is, that whatever thing they infer therefrom, is not ſufficiently proved. Juſt ſo, many aſſume in Morality the doctrine of Temperaments, before they have proved their Poſſibility, as they are deſcribed by them.

Of definitions.

V. If in defining a thing, we aſſume ſuch things, as of whoſe Poſſibility we are not certain, or as we cannot tell,

whether they can co-exiſt, or be mutually conſiſtent, ſuch Definition is *uncertain*. But if we aſſume impoſſible things, or combine what cannot conſiſt together, ſuch Definition is *falſe*. For we call *uncertain*, whatever we are not yet fully convinced of, whether poſſible or no: *Falſe*, if we affirm, that ſomething is poſſible, which notwithſtanding is impoſſible. For example: Some, in defining the Nature of Water, aſſign to its Particles a Cylindrical Figure. This Species of Particles they aſſume, but cannot prove. And therefore their Definition is uncertain, and but a bare conjecture. The Ancients, in defining the Digeſtion of the Food, aſſumed ſuch a degree of Heat in the Stomach, as was altogether impoſſible: This Definition therefore is falſe. If every thing, that contributes ſomething to the Formation of another, is not adduced, or even that, which each in particular contributes, is not circumſtantially enough propoſed, this real Definition is *incompleat* (§ 16. c. 1.) For example: If in *Boeckler*'s *Theatrum Machinarum*, I find the Machines in all their parts diſtinctly delineated, but in the Deſcriptions nothing but the Parts named, without any mention made of their Proportions and Dimenſions, the number of the Cogs in the Wheels, and ſuch like Particulars; I muſt own, that ſuch Deſcriptions

ſcriptions are very incompleat. In fine, if a real Definition contains nothing impoſſible, but every thing that is requiſite thereto; and nothing is omitted, which is neceſſary to its Formation, the Definition is in every reſpect *juſt*. As for inſtance: If one ſhould ſay, the intuitive knowledge of Perfection is Pleaſure; in theſe few Words is pointed out every thing, that happens in our mind, on the ariſing of Pleaſure therein; and whoever knows, what is Perfection, can diſtinctly explain to another that ſtate of the Mind. And thus his Definition is juſt.

VI. If we think that Something is or can be, and it actually is or can be, we call our Thought *true*. Again, it has been hinted already (§ 5.), that we call it *falſe*, when the contrary is the caſe. Now as that, which is inferred from juſt Definitions and Experiences or Obſervations, according to the Syllogiſtic Method, explained above, muſt partake of that Juſtneſs which the Definitions and Experiences themſelves partake of (§ 2, 4. c. 4.); the Propoſitions muſt neceſſarily be true, when duly inferred from true; *falſe*, if from falſe; and *uncertain*, if from uncertain Definitions and Experiences or Obſervations. But they may alſo be falſe, if unduly or unformally deduced from true Principles. And therefore in the caſe of Propoſitions, the whole matter turns on Of propoſitions.

the Syllogiſms, into which their Demonſtration may be reſolved, being juſt both in their Matter and Form. The Matter being the Propoſitions of which the Syllogiſms conſiſt, their Form muſt be determined by the Rules given (§ 7, ſeqq. c. 4.). If one can give no Demonſtration of a true Propoſition, he has proved it inſufficiently (§ 2. c. 4.), when he attempts a Proof. Geometry is replete with true Propoſitions fully demonſtrated, not to mention other parts of the Mathematics: but examples of uncertain, falſe, particularly incompleatly proved Propoſitions, we find, alas! but too many in the other branches of our knowledge. In my Philoſophical Writings I ſtand upon compleat Proofs: And therefore inſtances may be found therein, on peruſing them in their due order.

Theorems and axioms how blended together.

VII. Theorems are ſometimes given out as Axioms, but we very ſoon make the diſtinction, if we only conſider, whether they ariſe from one ſingle Definition (§ 13. c. 3.), or rather whether we meet not with many Words therein, from the diſtinct Notions of which a Proof muſt be drawn. Now if it is neceſſary to prove a Propoſition, it is not well done to give it out as an Axiom, and aſſume it without Proof. And therefore we judge in ſuch caſes, that Propoſitions are aſſumed without Proof, as the Perſon aſſuming them cannot prove them, though

though they ought to be proved. And this is generally the manner of thoſe, who pretend to demonſtrate, in the other branches of Knowledge, after the Mathematical method.

Propoſitions, how blended with experience.

VIII. Some alſo uſually confuſe or blend the Propoſitions they have drawn from Experience or Obſervation, with Axioms. But we may very ſoon diſcover this, if we only conſider, whether we could be led to ſuch Propoſitions by means of our Senſations (§ 1. c. 5.). But how to judge of Experiences or Obſervations may be ſufficiently learned from Chap. V.

Caſes of judging of problems.

IX. In the Solution of a Problem we ſhew, how ſomething may be done or made, or alſo how it may happen (§ 14. c. 3.); and therefore here the following caſes offer: We conſider either the things themſelves, or their Juſtneſs or Truth. As to the firſt, the Rules preſcribed for the purpoſe are either ſufficient, or they are not; or they are of no manner of ſervice for the purpoſe, but rather detrimental. As to the ſecond, we ſee plainly from Experience, or from Proof, that the Rules anſwer, or that they do not, or it is ſtill unknown, whether they can anſwer or no; or even, in caſe of their anſwering, we are unacquainted with the Method, how to put them in practice. And hence there

ariſes a variety of Judgments concerning the Reſolution of Problems.

Solution, when juſt or not.

X. If we are convinced from Experience, or alſo from Demonſtration, that upon doing only the things contained in the Reſolution of the Problem, that thing muſt neceſſarily follow, which the Problem requires; and if it is no leſs known, either from Experience, or by a foregoing Proof, that all the Rules ſhall anſwer, and the Method, how to put them in practice is not unknown; the Solution is *true*, *compleat* and *accurate*: that is, is attended with Succeſs, and contains every thing neceſſary, and nothing ſuperfluous. A great variety of ſuch examples may be ſeen in my Mathematical Writings, as alſo in my Morality and Politics. As an example may here ſerve that which we have advanced concerning the gaining diſtinct Notions (§ 21. c.1.), and concerning other Problems offering in the courſe of this Work: In the contrary Caſe, the Reſolution is *falſe*, *incompleat*, and *inaccurate*, that is, is good for nothing. To this Head may be referred, if one undertakes to teach, how to procure full-blown Flowers; namely, that they muſt be Sown and Tranſplanted in the Increaſe of the Moon, when ſhe is in a certain Sign in the Heavens, alſo at a certain Hour of the Day; nay, to this Head may

may be referred all Aſtrological Problems, and the whole buſineſs of Nativities.

XI. If the Rules for the Solution of a Problem are practicable, but ſome of them unneceſſary for the purpoſe, the Solution is *true* and *compleat*, but not *accurate*. For inſtance: If with *Vitruvius* we ſhould order to fell Timber, ſo as in Auguſt to cut into it on one Side quite to the Heart of the Pith; and according to *Alberti* lop the Branches, and lute or loam over the Wound; and laſtly in the Beginning of Winter fell the Tree, but, according to *Vegetius*, in the Decreaſe of the Moon: This Solution is indeed true and compleat, but not accurate, as ſomething ſuperfluous is added, namely the Felling in the Decreaſe. A ſolution when unaccurate.

XII. If we reach not the propoſed end, though all is done which is contained in the Solution, and all that it preſcribes is poſſible, the Solution indeed is *true*, and contains nothing *ſuperfluous* or redundant, but yet it is *incompleat*. As if we wanted to reclaim a Drunkard, by barely repreſenting to him, that he throws away both his money and time to no good purpoſe. This is true, but yet inſufficient, as a great deal more is requiſite. When incompleat.

XIII. If we barely reach to the End by the Rules preſcribed in the Solution, and know not how to accompliſh or execute; the Solution indeed is *true*, but *incompleat*. Another caſe.

This would be the caſe, did I want to recommend a certain piece of Work, as a means of becoming rich, but did not point out the means of getting that piece of Work. In this caſe is Mr. *Locke*, when he would point out in what manner to read a Book with profit, in order to arrive to a ſolid Knowledge; ſuch as the recommending a cloſe attention to the Connection of the Notions contained in a Propoſition, and the finding out on what Ground, or Principle, each Propoſition reſts; without ſhewing in what manner to diſcover the Connection of Notions, or even to find out the Ground on which a Propoſition reſts. He therefore gives Rules, which a young Perſon or Novice, to whom he gives Advice, is not of himſelf qualified to practice. Such incompleat Solutions are very common out of the province of Mathematics, and yet they are the beſt we generally meet with.

Solution, when impoſſible.

XIV. If what the Solution preſcribes is impracticable, it is then *impoſſible:* As if one ſhould recommend to another the Invention of a perpetual Motion, in order to gain the favour of a great Perſon. It follows not hence however, that the Problem is in itſelf impoſſible; but it muſt be ſhewn, by him who would recommend it, that there is no other Solution poſſible: As in the preſent caſe there may be another

ther practicable mean of gaining the great Man's favour. And it is to be remarked, that here is ſuppoſed as impoſſible, that which is not in the power of the perſon who would undertake it, though in itſelf poſſible.

When falſe.

XV. If that which the Solution preſcribes is indeed practicable, but unſerviceable, nay detrimental, the Solution is *falſe*. As if one ſhould recommend the drinking Wine to a perſon under Diſquietude of mind, in order to baniſh cares; the Drinking is indeed practicable, but yet his Diſquietude of mind is not thereby diſſipated, nor Tranquillity reſtored. A Perſon, drinking in company with others, may, indeed, for a time forget that which gives him Uneaſineſs; but when by himſelf again, his Uneaſineſs recurs, and therefore is not removed: And conſequently the Solution is falſe.

Solutions from experience, what caution to be uſed in.

XVI. But we are to be much on our guard, on learning from Experience, that by this or the other Mean a certain End may be obtained, not, without ſufficient grounds, directly to conclude from one to all Caſes in general; namely, not before we have ſhewn, that all the Circumſtances in the one Caſe exactly correſpond with thoſe in the others. Thus in Books of practical Geometry we often find Solutions of Problems, which anſwer tolerably well in

in ſmaller Figures, delineated on Paper, but in larger, are ſubject to conſiderable Errors. And as the Prudence of moſt men conſiſts in imitating the Actions of others, or their own preceding Actions in ſimilar Caſes; daily experience, alas! affords more examples than enough, in which this Rule is miſapplied. And even in Medicine, Concluſions are often drawn, to the no ſmall detriment of Patients, from a certain particular Caſe, to all Caſes in general; when a Judgment is to be formed of the Uſe of Medicines, or, in general, of the Method of Cure.

When a thing may be deemed uncertain.

XVII. We are farther to guard againſt directly giving out for Uncertain, what to us may appear ſuch. As we cannot properly do this, till we have firſt proved, that the Truth of the Premiſſes, employed in our Reaſonings, are equally incapable of being proved by others as by us; or if we are in queſt of any Notion, we would affirm, that it is equally inacceſſible to others as to ourſelves. But yet, alas! nothing is more common than for Perſons to judge of others, as in general, ſo in this Caſe, by their own Standard.

How to judge of the utility of things.

XVIII. But above all things we are to be on our guard againſt a Judgment on the Utility of any branch of Knowledge. For as the Knowledge of a Truth is ſaid to be uſeful, when promoting the Happineſs of Life;

Life; and as this is to be judged of, either from the Perfection derived to the Soul, to the Body, or to our external State or Condition, in ſo far as it is either obtained, or with more eaſe obtained, or even increaſed; as all this will be more fully deduced in the doctrine of Morality; one cannot with propriety call a branch of Knowledge uſeleſs, till he can prove, that it is impoſſible a Caſe can happen, in which it can, either mediately or immediately, contribute ſomething to promote the ſaid Perfection. And the Proof of this preſuppoſes a very extenſive degree of Knowledge, and muſt therefore prove a very difficult taſk. In other Caſes we can only ſay, the Uſe is to us a thing unknown; or that for our part, we either know not how to uſe it, or we cannot.

CHAP.

CHAP. X.

Concerning the Manner of JUDGING *of* BOOKS.

Diviſion of books.

I. WRITINGS or Books either treat of Facts, or of Dogmas or Doctrines. The firſt, which are uſually called *Hiſtorical*, relate either the Facts or Phenomena of Nature, or the Facts of Men: The laſt are called *Dogmatical*.

Requiſites of hiſtory.

II. We can require nothing farther in an Hiſtorical Writing, than that every thing be related in ſuch Order, and with ſuch Circumſtances, as they happened. And therefore there are three Virtues or Qualities requiſite in Hiſtorical Writings, Truth, Completeneſs, and Order.

How to judge of its truth.

III. As we can have no ſcientific Knowledge of Hiſtorical Truth, but only a Belief; ſo we may form a Judgment thereof, on attending to what was advanced concerning Faith or Belief (§ 5, ſeqq. c. 7.)

IV.

IV. The Completeneſs of Hiſtorical Writings is to be judged of, from the Author's Deſign: But this may be various. I therefore judge it not unſerviceable to exhibit in general the ſeveral Ends a Writer may have in his eye. How of its completeneſs.

V. Whoever deſcribes the Facts or Phenomena of Nature, intends either to convey to the Reader a Notion of animate and inanimate Creation, and of the ſeveral Phenomena of Nature, particularly the more rare; or relating the Operations or Effects of natural Things, he deſigns to furniſh ſolid principles for an accurate knowledge of them. In the firſt Caſe, the Author attains his End, if he attends to what was ſaid of adequate Notions (§ 16. c. 1.) But in the ſecond, he muſt adduce all, even the leaſt conſiderable circumſtances, of his Experiment or Obſervation (§ 2, 12. c. 5.) Of the Laſt, my Eſſays in Experimental Philoſophy afford a clear example; from which may at once be ſeen, how this branch of Hiſtorical Knowledge increaſes with the increaſe of the Science. End in natural facts.

VI. As to the Hiſtory, narrating the Facts of Men, that very End may be propoſed, which in all our actions we ſhould intend, if we only give ear to our reaſon; namely, our own Perfection, from which the Glory of God, and the Advancement of the Common-weal cannot well be ſeparated, End in hiſtory.

parated, as being indiſſolubly connected therewith; in regard Perfection conſiſts in nothing other, but in the mutual agreement or harmony of all our Actions, both natural and free or voluntary; which is obtained, if our voluntary Actions are determined by us from the very ſame Ends or final Reaſons, by which the natural Actions, which are not in our power, have been determined by God: Concerning which an adequate Notion may be gained from my Moral Philoſophy. Hiſtory is to give Mankind examples of Virtues and Vices, particularly of Wiſdom and Folly, in order to their Inſtruction. Now to attain this End, Hiſtory muſt be written in ſuch a manner, as that on comparing the Actions of Men with their Condition, we may thence diſcover the Rules of the Divine Providence, whereby we ſhall be ever more and more convinced of the Perfections of the Divine Being; and thus our Wills be inclined to ſuch Actions, as are becoming both the Divine Perfections, and our own Nature: Which ſerves the better to explain, what I have written in the Moral Philoſophy concerning our Duty to God, and in the Metaphyſics, concerning the Perfections of God. From the Actions or Conduct, and from the Lot of others we ſhould learn Rules of Prudence, whereby we may be able to promote the Common-

weal,

weal, and our own Happineſs in particular. And the Virtues and Vices muſt be fully delineated in Examples, together with the Cauſes, which have miſled Men; the Occaſions, which adminiſtered to them; and the ſeveral Conſequences ariſing therefrom: To which purpoſe again, my Moral and Civil Philoſophy may contribute not inconſiderably.

End in church hiſtory.

VII. But in particular, Church Hiſtory is to be executed in ſuch a manner, as that we may thence learn the prudence of promoting, to our utmoſt ability, the welfare of the Church; which we obtain, if the Hiſtory exhibits circumſtantially enough whatever means have contributed to maintain the Church in a flouriſhing condition; the reaſons of its falling to decay; and the remedies applied to that calamity, either with or without ſucceſs. And in this we may ſo much the more eaſily ſucceed, from what I have advanced concerning the promoting the Study of Virtue in a Common-weal (Polit. § 317.), concerning Churches and Feſtivals (ib. § 320, ſeqq.), and concerning the Utility of Religion in a State (ib. § 366, ſeqq.).

End in civil hiſtory.

VIII. In like manner, Civil Hiſtory ſhould be ſuch, as that from it may appear, which Means made a Common-weal flouriſh; which the Cauſes of its downfal; and which the Remedies uſed for its reſtoration;

tion; which Schemes were attended with ſucceſs; and which failed; and in what manner all Hindrances were removed out of the way; which are the Rights or Titles of Sovereigns to their Dominions; and which their Pretenſions or Claims to thoſe of others. To this purpoſe, my Politics or Civil Philoſophy may contribute conſiderably; as I there exhibit ſuch ſufficient grounds for whatever can poſſibly offer in a Common-weal, as are not readily to be met with elſewhere.

End in literary hiſtory.

IX. In the Hiſtory of the Learned, a particular attention is to be had to the degree of Perfection, to which the Sciences have been carried. In particular it muſt be there ſhewn, where the Diſcoveries, already made, are to be found, in order to our not being deprived of the knowledge of uſeful things, if incapable by our own reflection to make thoſe Diſcoveries; nor, were we capable, needleſſly to waſte our time on what has been already diſcovered, as we might employ it to much better purpoſe on ſubjects, that have not yet been treated. It muſt be farther ſhewn, in what manner to proceed in order to make other and farther Diſcoveries from thoſe already made, for the greater advancement of the art of Invention. From this it is evident, that thoſe, who would write a Hiſtory of the Learned, and of the Arts and Sciences, in

in this manner, muſt not only have made great progreſs in the Sciences themſelves, but be furniſhed with a variety of Books, and have a great deal of leiſure time for Reading. And therefore it is no wonder, if this branch of Learning is ſtill very imperfect.

To judge of the order obſerved in hiſtory.

X. The Order to be obſerved in the Hiſtorical Narrations of the tranſactions of men, may be very eaſily ſeen from the Circumſtances, particularly from the Time. In Natural Hiſtory it may be evidently perceived from a repetition or imitation of an Experiment. It may be alſo diſcovered by Reflection, when we enquire into the Reaſons why, and Manner how, a thing happens (§ 10, 11. c. 6.).

Different caſes, in which we judge of doctrines.

XI. It is unneceſſary to give particular Rules concerning Hiſtorical Writings, as they may be eaſily diſcovered from what has been ſaid, and as our deſign is to go no farther, than the province of Logic permits, whoſe manifold uſes we barely propoſe to ſhew. And therefore we will now proceed to thoſe Writings, wherein certain Doctrines are propounded. And in order to paſs a Judgment on theſe, we conſider either the Things themſelves, or the Manner in which they are propounded. The firſt Caſe reſolves itſelf into ſeveral branches: For, either the Propoſitions are proved from their genuine Grounds or

Principles, or barely ſet down without Proof. Beſide, either every thing, that can poſſibly be ſaid on a ſubject, is advanced, or it is not. If the Propoſitions are demonſtrated, we are to attend either to the Nature of the Principles, or the Manner and Method in which the Demonſtration is carried on. The Principles are apparently either true, or falſe, or ſtill doubtful. If true, either the Author ſhews their Truth, or cites an Author that does, or he omits both. In this laſt Caſe, either the Principles are of ſuch a Nature, that any one may eaſily perceive their Truth, on the leaſt attention, or the Reader may recollect where they have been proved by other Authors, or neither of theſe things may happen. If we conſider the Form or Nature of the Demonſtration, either every thing is orderly deduced, or we do not plainly enough ſee, how one thing follows from another. Again, either the following Propoſitions are connectedly drawn from the foregoing, or each Propoſition has its own peculiar Principle, from which it is demonſtrated.

A writing, when compleat.

XII. If every thing is propounded on a ſubject, that poſſibly can, according to the circumſtances of the time, in which the Author writes; the Writing is, at leaſt in that reſpect, full and compleat. Now in order to form a judgment of this, it is neceſ-

neceſſary the Reader be very converſant in literary Hiſtory.

XIII. We cannot therefore with juſtice deſpiſe an Author, nor indeed find fault with him, if according to the condition of his times, his work is leſs compleat, a great deal relating to his ſubject being afterwards diſcovered; or if leſs full than his times admitted, when omitting things, which were not to his purpoſe. And therefore in the firſt Caſe we ſhould know, at what time a Writer lived, and what Diſcoveries were then made: But in the ſecond Caſe, the Reader muſt make himſelf acquainted with the Deſign of the Book, either from the Title-page, or Preface, or from ſome other Circumſtances. Caution to be uſed here.

XIV. If an Author is fuller of the Diſcoveries already made than his deſign ſeems to require, he writes a Book full of ſuperfluous things, and thus too *prolix*. A book, when too prolix.

XV. If an Author advances Propoſitions, which are barely drawn from Experience, he is ſaid to reſt his Book on bare Experience. Now if he extends ſuch Propoſitions too far, and is not on his guard to keep within the proper limits, he aſſumes *Uncertainties* for *Certainties*. When advancing uncertainties for certainties.

XVI. If we cannot perceive from a Book, whether the Author extends his Propoſitions beyond the due limits of Experience, or adduces Propoſitions without When accurate and not accurate.

Proof, which otherwiſe ought not to be admitted, or pre-ſuppoſes ſuch Propoſitions in his Proof, as are leſs known, or at leaſt leſs familiar to the Reader; ſuch a Book is *inaccurate*. On the contrary, if every particular is ſufficiently explained and proved, the Book is *accurate*.

When ſolid or otherwiſe.

XVII. If all neceſſary Terms are diſtinctly explained, and each Propoſition duly demonſtrated from irrefragable or indubitable Principles, the whole is *ſolidly handled*. But if either falſe or doubtful Principles are aſſumed, or if ſuch Accuracy is not obſerved in demonſtrating; the Performance is *ſuperficial*, and far from being *ſolid*.

A huddled compilation, what.

XVIII. If between the Principles and Propoſitions pretended to be drawn therefrom no neceſſary Connection appears, and the Connection, if any, be ſought in the bare affinity of Terms; the Author of ſuch a Work has without judgment huddled together a *Miſcellaneous Compilation*.

A book, when diſtinct, and when obſcure.

XIX. If the neceſſary Terms, are either not all explained, or not diſtinctly enough, or if the Connection of a Propoſition with its Principles does not diſtinctly appear, 'tis impoſſible rightly to underſtand ſuch a Book (§ 3. c. 2.), and therefore it is *obſcure*. And hence at the ſame time it appears, how a Book ſhould be qualified, in order to be *perſpicuous*.

XX.

XX. In general, unintelligent Perſons form to themſelves quite different Notions of Obſcurity and Perſpicuity: Namely, they denominate Obſcure, that which requires a greater degree of Reflection and Attention, than they have hitherto beſtowed on the things they have learned. On the contrary, perſpicuous, that which requires no great degree of Reflection. They ſhould rather ſay; a thing is Difficult or Eaſy, as they are either more or leſs accuſtomed thereto. From this prejudice it is, that many call Mathematical Books, and every Subject, that is ſolidly handled, Obſcure. How one may fail in forming a judgment in this caſe.

XXI. In fine, if the following Propoſitions are connectedly drawn from the foregoing, as is uſually done in Mathematics, *every thing hangs well together*. And the contrary, if not. When things hang well together.

XXII. Here alſo I muſt remove a Prejudice, which *Arnauld*, in imitation of *Ramus*, has in our day put into people's heads; namely, as if that Order alone were the beſt, in which every thing, relating to a Subject, was brought together under one Head: And on the contrary, as if there was nothing but Diſorder and Confuſion, if things are ſo placed one after the other, as they ſhall moſt naturally follow or ariſe from each other. The Firſt is the Order adopted by the Schools, and by the generality of the Learned: But the Prejudice as to order.

Second is the Order of Nature, moſt approved of by Mathematicians. The Former is moſt for the benefit of Memory; but the Latter, for that of the Underſtanding, in order to Illumination and Conviction. By the Former, there is no accurate Demonſtration poſſible, as *Arnauld* and *Lamy* abundantly ſhew in their Elements of Geometry: By the Latter, you need never depart from the rigour of Demonſtration, as the Writings of the ancient Geometers abundantly ſhew. And therefore the Order of the Schools is entirely abandoned to the herd of the Learned, and to Beginners or Novices: But ſuch, as want to go deep into Truth, prefer the Order of Nature. And this laſt I cloſely follow, as well in my Mathematical, as Philoſophical Writings.

Books, beſt, and worſt, which.

XXIII. I have hitherto ſpoken of the ſimpleſt Caſes; but as other Caſes are put together of theſe, it is no difficult matter in any complex Caſe to frame ſimple Judgments. Suffice it therefore to have hinted here, that a Book in its Kind is perfect in every reſpect, if it is full and compleat, if every Particular is ſufficiently defined, and ſolidly demonſtrated, if perſpicuous, and every thing hangs well together. But on the contrary, good for nothing, if incompleat, if nothing is ſufficiently defined and demonſtrated, if put together without judgment,

ment, if obſcure, if the following and foregoing Parts hang not well together. All theſe things appear from what we have ſaid above concerning the Judgment to be paſſed in particular Caſes.

CHAP. XI.

Concerning the Manner of READING *with Profit.*

Readers, view of.

I. WE read Books, in order to know their Contents. And thus there is requiſite for that Purpoſe, (1) That we duly underſtand the Author. (2) That we rightly impreſs on our Memory the Things propoſed by him.

Hiſtory, how to be read.

II. As Hiſtorical Writings barely narrate the Facts that have happened (§ 1. c. 10.); there is requiſite no great degree of underſtanding and reflection to read them, ſo we only attend duly to what we read, and have our mind free and diſengaged from other thoughts. But in order to the Retention of what we read, we muſt guard againſt reading too faſt, and too much at a time (§ 24. c. 1.) The Caſe is quite different, if we want to judge of the Credibility, Order and Perfection of a Hiſtory (§ 3, ſeqq. c. 10), or to apply Hiſtorical Knowledge to its various uſes (§ 6, ſeqq.

c.

c. 10.); in that Caſe Judgment and Reflection are abſolutely neceſſary. And the more any Perſon has been exerciſed in Reflection and Meditation, the better he may hope to ſucceed here.

Deſign of a book and its ſeveral parts.

III. If we happen to read Books, wherein certain Doctrines are propounded, we are above all things to attend to the Scope of the whole Book, its ſeveral Chapters and Sections, in a word of every Part thereof, in order to know the full Deſign of the Author (§ 1.)

How diſcovered.

IV. The Deſign of the whole Book is known either from the Title-page, or the Preface, wherein we generally find, what gave occaſion to write, what it is that the Author propoſes to himſelf in writing, and why he pitched on ſuch a Method, and not on any other.

To reduce a truth to its proper claſs, and paſs a judgment on it.

V. But whatever can poſſibly offer in ſuch a Book, comes under the head either of Definition, of Experience, or of Propoſitions with their Demonſtrations, or laſtly, of Scholia or Remarks. Now to the end that this may more eaſily appear, we are to abſtract each Propoſition in common plain Terms from the Context, and ſeparate each from whatever is advanced either for Illuſtration, Definition, or Demonſtration. And if we then perceive under what Claſs the thing treated on comes, we muſt examine it in a proper manner by the

the Directions of Chap IX. and then paſs a rational Judgment thereon. And in order to Retention, we muſt reflect on and weigh the Subject for ſome time in our Mind.

Meaning, how diſcovered.

VI. We are particularly to be careful, in order to underſtand an Author (§ 1.), to connect with his Words the very ſame Notions, which he himſelf does (§ 2. c. 2.): As failing in this, we frame a falſe Meaning, and impoſe it on him; a thing very commonly done.

Farther explained.

VII. Now the Author either explains in what Senſe he uſes his Words, or he does not. In the firſt Caſe, nothing farther is neceſſary but by a repeated Peruſal and Reflection to render his Definitions familiar, that they may readily recur to our mind, as often as the Terms offer. In the ſecond Caſe, we are to enquire into the ſeveral Significations, which a Term can poſſibly bear (§ 16. c. 2.), and then conſider, which is the propereſt, or moſt adapted. For as no one, without ſome appearance of Truth, affirms or denies any thing; we have reaſon to believe, that the Author had an eye to ſuch a Meaning, unleſs we can ſhew, that he has written from Memory only, or only tranſcribed from other Books.

VIII.

VIII. But as a Word is ſuſceptible of ſeveral Meanings; it often happens, that it has not always the ſame Signification in the different Parts of a Book, though the Author imagines it has. We are therefore to guard againſt concluding directly, that he contradicts himſelf; when we ourſelves keep conſtantly to the ſame Meaning.

Different ſignifications of a word in the ſame book.

CHAP.

CHAP. XII.

Concerning the INTERPRETATION *of a* BOOK *written with Judgment, and particularly the* HOLY SCRIPTURES.

Book, when underſtood.

I. A Book written with Underſtanding, and particularly the Holy Scriptures, is not a Collection of mere empty Sounds; as in that Caſe it would be of no manner of uſe. And therefore with each Word muſt be combined a certain particular Notion (§ 3. c. 2.); and whoever would thus underſtand a Book, muſt carry along with each Word the very ſame Thought or Notion, which the Author intended to conjoin therewith (§ 6. c. 11.).

Notions of words in ſcripture we have not immediately.

II. Now as to the Holy Scriptures in particular, the Spirit of God does not uſually excite the Notions in our Minds immediately, which we are to join with his Words: As in that Caſe there would be no neceſſity of tranſlating the Original Text into other Languages, as it would ſuffice to read with an earneſt deſire of underſtanding the Scriptures, and of ap-

plying them to our own State, for the Holy Spirit to produce in us theſe Notions. But this is contradicted by Experience.

III. And therefore the Words muſt in themſelves be fitted to excite thoſe Thoughts in us, which we are to have on occaſion of the Words, if not blinded by Prejudice, or otherwiſe prevented by our own Inattention. *But the words excite them.*

IV. And thus, God as well in his Word, as any other intelligent Writer, muſt either explain, what Thought or Notion we are to join with this or the other Word, or he muſt pre-ſuppoſe no other Notion, but what we have had before. *What notions are in ſcripture preſuppoſed.*

V. But as we can have no other Notion, but that which is excited in our Mind when we feel the Objects preſent to us (§ 5. c. 1.); ſo neither are we to join any other Notions but theſe with the Words of Scripture. *Farther explained.*

VI. Hence we farther underſtand, that God may in Scripture employ ſome Terms concerning ſupernatural Objects, of which we have naturally no Notion, and which he notwithſtanding leaves unexplained or undefined. For, when by means of other Doctrines which we underſtand, a Change has preceded in our Minds, we feel it in ourſelves, and obtain a Notion thereof, though the Term by which it is denoted, is not diſtinctly explained, or defined, in Scrip- *Some terms in ſcripture not to be explained.*

Scripture. And even the ſame thing happens in Profane or Secular Writings.

Modeſty required in explaining Scripture.

VII. But if God is pleaſed not to grant us altogether diſtinct, or adequate Notions of ſome things by his Word, we are by all means to ſubmit, and on no account, with the Scorners, to hold the things, expreſſed therein, as having no Reality or Truth (§ 12. c. 2.) In regard we are to reſt ſatisfied with that meaſure of knowledge, which God is pleaſed to impart, as knowing it to be ſufficient for the end, propoſed by him, to be obtained by his Word.

Scripture truths, how to be judged of.

VIII. And the Doctrines propounded in Scripture may be divided into the very ſame claſſes of Truths, into which the Secular or Natural are: And hence may with great benefit be examined in the ſame manner, as we have ſhewn (§ 5, ſeqq. c. 9.) As from the work of Redemption God's Wiſdom may be plainly ſeen, *Epheſ.* iii. 10; ſo Divine Truths may, like other Truths, have a mutual connection, ariſing from the Notions we obtain of them. Beſides, there are many Truths propounded in Scripture, which relate to God, as he is Creator, Preſerver and Governor of the World, and to Man, as he is a Creature. But now as theſe Truths may be alſo known by the right uſe of the natural Powers of the Underſtanding, as appears from

from my *Rational Thoughts on God, the World, and the Soul of Man*, as alſo from my Moral Philoſoply; ſo much the leſs Doubt muſt remain, that there is alſo a Connection between thoſe Truths.

Interpretation of ſcripture, what.

IX. Herein therefore conſiſts the Explanation of each Writing, and thus alſo of Holy Writ, (1) That we point out the true Meaning of the Words (§ 4, 5, 6.) And (2) The Connection of the Truths (§ 8.)

Faith not to be blended with ſcience.

X. But we need be under no apprehenſion, that in this manner Faith will be blended with Science. For as in a Syllogiſm, or Ratiocination, we admit the Concluſion only on account of the Premiſſes (§ 24. c. 4.); in like manner alſo the Concluſion is only to be believed, when the Premiſſes reſt only on bare Faith.

Utility of the interpretation preſcribed.

XI. But leaſt of all is this Labour to be deemed uſeleſs. For if at the ſame time we both know and believe the Truths, which regard the Creation and Preſervation of the World, as alſo the Regularity and Perfection of our own Actions; we may with greater force refute the Enemies of revealed Truths, alſo with more efficacy remove the Scruples that diſquiet the Minds of others; things highly neceſſary in our day. But if we perceive the Connection of the Truths, that regard the work of Redemption, we ſhall thereby

be convinced afreſh of the Divine Attributes, and ſtirred up to the Glorifying of God, and to a ſuitable Conduct; as appears more fully from what I have advanced in the Moral Philoſophy, concerning our Duty to God, and the Diſtinction there is between Chriſtian and Natural Virtue (§ Mor. § 650, ſeqq. 676.).

Original languages, their uſe in interpreting ſcripture.

XII. The original Languages only ſerve to enable us to form a Judgment, whether every thing in a Tranſlation is expreſſed by a proper Term. But we go too far, if from a Grammatical Analyſis we would derive the Notion we ought to join with a Word, or imagine thence to ſhew its Emphaſis; as Grammar can at moſt only pretend to point out the Notion Men formerly had, who firſt gave the thing ſuch a particular Name. But if I wanted to know, whether there was a good Reaſon for their ſo-doing, I muſt firſt procure a Notion of the thing in ſome other way, in order to judge, whether their Notion was juſt or no. And even in this caſe the matter ſometimes reſts on bare Conjecture. For though the Truth or Juſtneſs of the Notion may afford a ground or reaſon for the Appellation, yet the Inventors thereof may from miſtaking the thing, give it a Name according to the Notion they themſelves entertained of it. And leaſt of all have we any ground to ſay, that God accommodates himſelf to the

ground

ground or reaſon, which thoſe had in view, who originally appropriated to the Term a certain Meaning; and as little can we alledge, that God has employed no Term, whoſe Signification took its riſe from erroneous Notions: For we may uſe a Term, without partaking in the Error, which gave riſe thereto.

CHAP. XIII.

Concerning the Method of CONVICTION.

Conviction, what.

I. WHOEVER wants to convince another, deſigns to certify, that Something is either true or falſe, probable or improbable. As for example: That in the Propoſition, *the Moon is a Light*, the Predicate, *a Light*, is duly connected with the Subject, *the Moon*.

Terms, how to be defined.

II. And above all things therefore every Term in a Propoſition ſhould be defined, in order to be underſtood by him whom we would convince (§ 2. c. 2.); unleſs we are ſufficiently appriſed, that he is already Maſter of ever Notion requiſite thereto. As in the foregoing Propoſition it is unneceſſary, that we ſhould define, what is the Moon, as every one knows, we mean thereby that Body in the Heavens, which among all the Stars moſt enlightens our Earth in the Night: but Light we may define; namely, that it is that which renders the Bodies round us Viſible, as it is not

not every one that can readily recollect this Definition.

III. To the Definition ſucceeds the Demonſtration, which laſt muſt be carried on ſo far, till in our Syllogiſms, or Ratiocinations, we come to ſuch Premiſſes as are not only known to the Perſon to be convicted, but ſuch as he can have no doubt about their Juſtneſs. But if he happens to know nothing *at all* of the matter, the Demonſtration muſt be carried on till we come to Definitions or evident Experiences or Obſervations, or other identical Propoſitions (§ 21. c. 4.): For Conviction is produced in our own Mind, while we orderly proceed from Definitions and Obſervations, till we come to the Propoſition we want to demonſtrate; and therefore, neither can we in any other way Convince another. And as we have ſet out with Definitions and Experiences, and from theſe have advanced to ſuch Propoſitions as we employ for Premiſſes in the Demonſtration of our particular Propoſition, juſt ſo muſt we proceed in reſpect to other Perſons. Demonſtration, how to be propounded.

IV. And therefore it is a thing highly valuable in Mathematics, that nothing is aſſumed in the Demonſtrations, which has not been previouſly made out, and that all along there are References to what went before. For from the References I may eaſily learn, what I muſt previouſly know, Peculiar means ſupplied by mathematics.

before I can be Convinced of the Juſtneſs of a Propoſition. As for inſtance: In the Demonſtration of the tenth Propoſition of my German *Elements of Geometry*, § 101, you find References to § 97 and 59. In § 97, to § 25, 20, 56, 96, 61, 59, *Geom.* and § 28, *Arithm.* In § 56, to § 19, 17, 54. But in § 96, to § 49, 12, 41, 50. In § 61, to § 59 *Geom.* and 28, 31, *Arithm.* Moreover in § 59, there is a Reference to § 56. In § 56, to § 19, 54, and 17. In § 50, to § 5. And therefore in order to Conviction, we muſt regularly go through §28, and 31, *Arithm.* and § 5, 12, 17, 19, 20, 25, 41, 49, 50, 54, 56, 59, 61, 96, 97, *Geom.*

To be wiſhed for in the other ſciences.

V. Out of the Province of Mathematics it proves a thing of greater difficulty to find out whatever muſt neceſſarily be premiſed, before we can hope for a full Conviction. And as it requires no ſmall degree of Reflection, to recollect every thing, that can in any meaſure contribute to Conviction, nay a thing quite impoſſible to moſt People, very few being qualified for ſuch a taſk; it were therefore much to be wiſhed, that out of the province of Mathematics we were careful to aſſume nothing but what was previouſly eſtabliſhed, always referring back to the proper places. But this is what we cannot expect, till we come more earneſtly to apply

ply ourſelves to the ſtudy of Mathematics. In the ſeveral parts of Philoſophy, which I have hitherto publiſhed, I have adopted that method, aſſuming in a Demonſtration no Principle which has not been made out, either in what went before, or which any one may learn from Experience; in the firſt Caſe always referring back to the place, where ſuch Principle is to be found. Now, whoever turns back to the Citations, till he finds there are no more of them, cannot fail to ſee what Truths, and in what Order, are to be learned, that he may come to the ſame Conviction which I myſelf have. And what ſome would perſuade us, that the References have not been proved, ſufficiently ſhews, and it is indeed a thing well known, that ſuch Perſons know nothing of a well-connected chain of Truths. *Euclid*'s Elements would be juſt the ſame to them, were they to turn to the middle of the Book, inſtead of going on regularly from the Beginning.

An aptneſs for conviction requiſite.

VI. Nor is it to be omitted, that our Underſtanding often acquires from the previous knowledge of other Truths a certain degree of aptneſs for Conviction, which when wanting, we loſe all our labour and pains in attempting it. As for example: By means of the Mathematics, as treated in my Latin Work, and of the Method in which for many years paſt I have taught,

as deſcribed in my *Ratio Prælectionum Sect.* 1. c. 1. § 38, ſeqq. I have myſelf by that means acquired a peculiar Aptneſs of conceiving Truths. And it is not at all ſtrange, if there ſhould be ſome, who, unpracticed in the Mathematics and the Sciences, and ſpending all their days in ſubjects that require only the exerciſe of the Memory, ſhould perſuade themſelves it was not poſſible to conceive, what I take to be a thing very conceivable.

Utility of the given rules.

VII. Whoever carefully attends to this, will not readily loſe his temper, if another ſhould refuſe to admit of Conviction; as he will own, no Conviction would take place with himſelf, were he in the ſame condition with the other. And he will be cautious in his diſcourſe, not to talk promiſcuouſly of ſubjects, of whoſe truth it is impoſſible to Convince ſome people; thereby only giving occaſion either to mock or to blaſpheme.

Definitions, how to be managed.

VIII. When we come to frame Definitions, we may Convince another of their Juſtneſs, either on exhibiting the Objects, from the conſideration of which we have taken them, or at leaſt bringing them to memory (§ 5. c. 1.), or on appealing to other Notions, which the Perſon admits, and from which our Definitions were taken or abſtracted (§ 26, 30. c. 1.). In the caſe of real Definitions, we may frequently refer

fer to the intuitive Knowledge or Preſence of the Objects (§ 56, 57. c. 1.), or make out the Poſſibility of the things we aſſume to form real Definitions with (§ 49. c. 1.), either from Experience or Demonſtration.

Experiences, how.

IX. If our buſineſs is with Experiences or Obſervations, and it happens not to be in our power to bring Another to have the very ſame; as if the Diſcourſe be concerning the luminous Ring round the Moon in total Eclipſes, or nearly total, of the Sun, much like that Glory, with which the Heads of Saints are repreſented, or concerning the Changes the figure of the fixed Stars undergo, when near the Moon, as obſerved by the celebrated *Caſſini:* We are in theſe Caſes to appeal to ſuch Facts, and adduce every thing that may ſerve to eſtabliſh their Credibility (§ 5, ſeqq. c. 7.). Now in this Caſe the Conviction is as ſtrong, as the degree of Credibility will admit.

What required of him, that is to be convinced.

X. In particular, the Perſon, that is to be convinced, muſt carefully attend to what is ſaid to him, and if unpracticed in ſuch matters, reflect often on each Particular, according to the Rules given Chap. IX. And in order to this, the other muſt give him all the aſſiſtance neceſſary. A Perſon ſtill unacquainted with ſuch Subjects, muſt take time, and like a Beginner or Novice run over ſomething every day, and the following

repeat with care, what was learned the preceding, in order to gain a familiarity with the Subject. If thoſe who affect a reputation from confuting others made this their rule, they would either acknowledge their Inability, or entirely aſſent to thoſe things which they deem either erroneous or dangerous.

Fault of the perſon to be convinced.

XI. Now whoever is too impatient, or too precipitate, to attend to, and weigh a matter in the manner preſcribed, and take the proper time for it, it is in vain to attempt to Convince him. And the fault is plainly his, he refuſes to be Convinced.

Fault of him who convinces.

XII. But the Fault may be alſo on our Side, if aſſuming either as poſſible or impoſſible a thing, whoſe Poſſibility or Impoſſibility the other, whom we attempt to Convince, acknowledges not; or if not diſtinctly enough defining our Terms (§ 2, 3.).

Vain perſuaſion of conviction.

XIII. We are to guard, not to blend (which yet daily happens) a vain Perſuaſion, that is, a falſe Opinion, as if we had a certain and thorough view of a Truth, which notwithſtanding we are very far from, with a ſolid Conviction thereof. Such a Perſuaſion we fall into, (1) when unaccuſtomed to ſolid Reflection and Diſcuſſion, and unacquainted with the Requiſites to Conviction. (2) From a prejudice of Authority, aſcribing too much to the penetration of others,

others, as if incapable of advancing but what was ſtrictly true; and holding for Truth whatſoever they affirm, only becauſe they have affirmed it; and admitting their Reaſons as ſufficient, becauſe advanced by them. (3) From entertaining too great a confidence in our own Abilities, and therefore not carefully weighing whatever is neceſſary to a full Conviction. (4) From Precipitancy, of which there may be ſeveral Cauſes, as not duly conſidering every Particular, though in our power to do it.

Means againſt the firſt defect.

XIV. We obviate the firſt Defect, either by a careful ſtudy of the Mathematics, where we may exerciſe ourſelves in Reflection as much as we will, and always with Succeſs, as we there meet with nothing but Truths ſtrictly demonſtrated; or by a familiar Acquaintance with the Rules requiſite to Meditation, of which there is a ſufficient ſtore in this Treatiſe.

Againſt the ſecond.

XV. In order to guard againſt the ſecond Defect, by which, in particular, Youth are miſled, though in Words they loudly diſclaim it, it would be highly ſerviceable, above all things, to remove the firſt Defect (§ 14.), as then the Second would drop of itſelf. But as ſuch, whoſe intereſt it is by their Authority to keep people in Darkneſs, is often a bar, it is our buſineſs to ſhew by palpable examples, how perſons of great Abilities, or thoſe who would paſs for

for ſuch, have failed in this reſpect; ſo that the Confidence in Abilities can never diſpenſe from a due Examination.

Againſt the third. XVI. But if well appriſed that perſons of great Abilities have miſcarried, and particularly obſerving, that ſuch are apteſt to precipitate as after ſome happy Diſcovery entertain an over-weening Confidence in themſelves, and recollecting at the ſame time how we ourſelves have been more than once deceived, deeming as true or as diſcovered what we had only a diſtant view of, we will not fail to be on our guard againſt the third Defect.

Againſt the fourth. XVII. In fine, in order to avoid Precipitation, as in conſequence of the firſt Mean (§ 14.) we have it in our power ſo to do, we ought to ſet before us the ſeveral examples of Precipitancy, and enquire into the ſeveral Cauſes thereof, to the end we may learn, that without a regular, logical Analyſis, which to the Experienced generally appears a childiſh and diſguſtful exerciſe, fit only for Novices, it is not poſſible to come at Truth; and owing more to Chance than Judgment if we do.

CHAP.

CHAP. XIV.

Concerning the Method of REFUTATION.

I. WHOEVER would refute another, undertakes to ſhew, that what the other maintains as a Truth demonſtrated, is either falſe, or dubious at leaſt. Refutation, what.

II. In order therefore to avoid all Logomachy, or Contention about Words, we are carefully to guard, not to impute to our Adverſary an Opinion he does not hold, a thing uſually happening in moſt Caſes, eſpecially where people affect a reputation of dexterity at Refuting others. But in what manner to come at the true meaning of the Opponent, appears from what was ſaid in the preceding Chap. § 2. Whoever, from a determined purpoſe of prejudicing another, does knowingly and wilfully pervert his Words, in order to charge him with dangerous Opinions, thereby to blacken his Character with the Unintelligent, and thoſe who have no time Logomachy, how to avoid.

time to examine ſuch matters with care, has no inclination to avoid a diſpute about Words; and it is not poſſible to reclaim ſuch a one by Logical Rules, as barely regulating the Underſtanding, where a Perſon honeſtly intends to know the Truth, but not amending the corrupt Will.

A hint concerning improper terms.

III. But though there is no room for Refutation, where there is only a diſagreement in Words, and not in the Thing itſelf: As if one ſhould ſay, the Soul performs all Operations in a living Body, and nothing more is meant by the Soul but the nervous Fluid, or Powers of the Body; yet ſometimes it is to be apprehended, that ſome unguarded Expreſſions may impoſe on the Unwary, and lead them to Error, eſpecially as there are not other Words wanting, by which more clearly to expreſs the ſame thing. Now, in this caſe, the Perſon may be modeſtly admoniſhed, to abſtain from ſuch unwary Expreſſions in future, and rather employ the more common. And in order to gain a more favourable hearing, it may be repreſented to him, that the rules of Prudence oblige every one to pitch on ſuch means, in every Caſe, as are moſt adapted to the End propoſed, and never endanger to ſwerve therefrom.

Method of refutation.

IV. But if the Diſagreement be about Things, and not Words, we are bound to convince the Diſſident in the manner as

was

was explained in the foregoing Chapter: And this is done two ways: For either we ſhew, that falſe, or at leaſt doubtful Principles, are aſſumed, or that undue Concluſions are made from undoubted Principles (§ 16. c. 7.); or that a Propoſition, which is maintained, is impoſſible, that is, implies ſome Contradiction (Met. § 12.): Which is done, when a Propoſition is aſſumed as true, and thence, in conſequence of undoubted Principles, we draw, by juſt Ratiocination, a Propoſition, which the Opponent himſelf allows to be falſe (§ 21. c. 4.), namely, as it contradicts a Propoſition, which he grants to be true. For, as the Syllogiſms in this Demonſtration are ſuppoſed juſt and genuine in their Form, the defect muſt lie in the Premiſſes, or the matter of the Syllogiſms, whenever a falſe Propoſition ariſes. Now as all the other Premiſſes are juſt, the Propoſition, which the Opponent maintains, and which, to pleaſe him, was admitted, and taken into the Premiſſes, muſt be falſe.

V. This laſt method, called the indirect Refutation, is commonly abuſed; as imagining, when we would refute an Opponent, we ought to charge him with invidious Conſequences, as flowing from his Principles, ſuch as the overthrow of Religion, Morality, Virtue and Honeſty, and the Subverſion of a State. But an indirect or apa- Drawers of conſequences.

gogical Demonſtration, as Mathematicians call it, or a plain and evident Proof of a latent Contradiction in a Propoſition, is quite a different thing from this manner of blackening a man's character with invidious Conſequences, as flowing from his Opinions. And as Drawers of Conſequences are generally ſuch as know little of the matter, and therefore neither dare, nor can venture on the merits of the cauſe which they would impugn (§ 4.); beſides, as they ſufficiently bewray, that it is not the love of Truth, but ſomething elſe they have in view, they are not ſatisfied with a ſingle Conſequence, but proceed from one Conſequence to another, as long as they can find any thing invidious; and theſe farther Conſequences they always repeat, as often as they imagine there is the leaſt appearance for charging their Opponent with the Firſt: So that drawing of Conſequences in this manner is become deteſtable to perſons of underſtanding and virtue; and it is of no other uſe, but to render an Opponent odious or ridiculous to the Ignorant, or thoſe who have no leiſure fully to examine the matter, as the Drawer has a greater or leſs deſire of doing hurt. And this is the reaſon that we have diſcarded it, like the other falſe arts of Diſputation, from our Logic.

VI.

VI. Now as the Perſon who is to be convinced, ought to give cloſe attention to every particular (§ 10. c. 13.), ſo he who Refutes, is to abſtain from every thing, that may diſcompoſe his Antagoniſt; and ſo to ſpeak and write, as not to give the leaſt ſuſpicion of holding him little and contemptible, eſpecially if otherwiſe a man of merit. And in general, from every Refutation, nothing but Candour, love for Truth, and for the erroneous Perſon, ſhould appear, and neither Envy, Haughtineſs, nor a deſire to injure our Antagoniſt; in a word, no vicious or baſe, but every virtuous and generous Purpoſe. How to guard our words.

VII. Whoever takes a different Courſe, behaves either as a Fool, or a Perſon of no Virtue. Either he acts ſo with Deſign, as perfectly well appriſed, that in this manner he can never gain upon his Antagoniſt to be of a different Mind; or he really purpoſes to bring him over to his Opinion. In the firſt Caſe, he intends expoſing his Antagoniſt to the Contempt of the Ignorant, in order to get himſelf a Name; or he lays a ground for Perſecution; and thus intends the other's hurt, envies his good name, and by barefaced Calumnies oppoſes his fortune in the World. Every one muſt ſee the extreme Viciouſneſs of ſuch a character, a mere ſink of vice, without any deſire to be ſerviceable, under the abſolute dom- Abuſe, whence, in refutations.

dominion of his Senſes, Imagination and Affections. In the ſecond Caſe, he makes choice of means, that carry him quite aſtray from his end. He wants to convince another of Error, but takes a method that directly thwarts his deſign. And hereby Wiſe Men are eaſily diſtinguiſhed from Fools.

How perſons of prudence and virtue behave.

VIII. And hence, at this day, we find, that Men of Learning and Virtue chuſe to have no concern with ſuch Antagoniſts as know not how to carry on with a virtuous decency their Refutations; eſpecially as, for the generality, they are Perſons not ſufficient Maſters of the Subjects they would refute. And when they find themſelves, from certain circumſtances, obliged to anſwer Perſons of Intelligence, who have exceeded in this reſpect, they paſs over with ſilence every paſſionate expreſſion, and never ſuffer themſelves to be miſled from the paths of Virtue by the vicious example of others. Such conduct ſhould be made a Pattern. It is equally laudable to be Virtuous as to be Intelligent, eſpecially, where Virtue is the reſult of Knowledge and Underſtanding, and not merely contracted from Cuſtom or Habit.

Severity, when to be uſed.

IX. At times it is neceſſary to ſhew a haughty and ignorant Antagoniſt his want of Underſtanding, the Inſolence and Pride with which he is puffed up, his vain Ambition

bition to overtop other People, and groundleſſly to leſſen their merited praiſe, &c. But yet no man can make this a handle to excuſe his vicious conduct; for even in this caſe the buſineſs is to be managed with proper Arguments, due Mildneſs, and requiſite Modeſty.

How to behave in reſpect of perſecutors.

10. It is alſo ſometimes neceſſary to defend one's character againſt the calumnies of Perſecutors, which they give out for Refutations. Now as in this caſe the buſineſs is, not only to reſcue one's Opinions from falſe imputations, as thoſe with whom ſuch abuſe and calumny have weight are incapable of examining and weighing the matter properly; but as a principal requiſite to weaken their credit with the world, and plainly to point out their want of Underſtanding and common Honeſty (§ 5. c. 7.); and particularly with thoſe, who may give them a favourable hearing, to call every thing by its proper Name. For here, where, through Perſecution, a man's good Name, Fortune and Life are at ſtake, the buſineſs turns not on a common diſpute among the Learned, but on an act of neceſſary Self-defence, in order to ward off an intended Harm; and this is to be judged of from Principles of Morality (Mor. § 853.).

CHAP. XV.

Concerning the Method of DISPUTATION.

Diſputation, what.

I. WHOEVER carries on a Diſputation with another, undertakes verbally to convince him of the Error of the Propoſition which he maintains.

Mutual contradiction of diſputants.

II. And thus he muſt deny, what the other maintains; maintain, what the other denies; give out as certain, what the other only holds as probable; deem uncertain, what appears to the other to be certain. And thus the Diſputants muſt always in ſome thing or other, contradict each other.

How to avoid diſpute about words.

III. And therefore it is above all things neceſſary, that the Terms of the Propoſition be defined, in order to avoid falling into a contention about Words (§ 2. c. 2.). And it is cuſtomary, when the Senſe is ſomewhat obſcure, to aſk the Signification of this or the other Word.

IV.

IV. A Reſpondent often refuſes to give any Explanation of Terms, either as he ignorantly imagines it is with a deſign to teize him; or as he has no diſtinct notion of his own Terms, and thus cannot explain them. Now, in order to extort an Explanation, we charge his Propoſition with Obſcurity, as its Terms have no determinate meaning. For if he affirms they have, he is bound to explain that meaning; the Signification of Words being entirely arbitrary, and thus their meaning not to be conjectured. How to force a reſpondent to an explanation.

V. When the Meaning is determined, the Opponent ſets about producing his Proof, and carries it on ſo far, till in his Syllogiſms he comes to Premiſſes which are admitted by the Reſpondent (§ 21. c. 4.). But as this laſt muſt own both the juſtneſs of the Premiſſes and of the Syllogiſms (§ 3. c. 13.), the Proof muſt be couched in formal Syllogiſms, one of whoſe Premiſſes we ſometimes omit, and thus form an Enthymeme (§ 17. c. 4.); namely, when well aſſured that the Reſpondent will not deny the Propoſition omitted. But we muſt begin with the laſt Syllogiſm, whoſe Concluſion contradicts the Reſpondent's Propoſition. Duty of the opponent.

VI. The Reſpondent ſhould reſume every Syllogiſm (§ 10. c. 13.); and, to ſhew that he has taken each Syllogiſm aright, Of the reſpondent.

ſhould repeat them once more. If the Syllogiſm is not in form, he ought to ſhew this: but if in due form; he muſt either admit the whole, or deny one, ſometimes both Premiſſes, and that either abſolutely, or conditionally, by a Diſtinction.

Farther duty of the opponent.

VII. The Opponent muſt prove the Propoſition denied by the Reſpondent, by a new Syllogiſm, in which that Propoſition comes to be the Concluſion; and, if the Reſpondent limits or diſtinguiſhes, either aſſume the Limitation, or ſhew its Nullity (§ 5.).

Formal ſyllogiſms why uſed.

VIII. To whoever recollects that which was above ſaid under Demonſtrations, and eſtabliſhed by an example, taken from Geometry (§ 22, 24, c. 4.), it will appear no ways ſtrange, that in Diſputations we require pure, formal Syllogiſms, and reject the method of common Diſcourſe. For whenever the Diſputants begin to diſcourſe or talk, they commonly go off from the purpoſe, and never come to a point.

Duty of the præſes.

IX. As the Præſes replaces or repreſents the Reſpondent, when at a loſs to anſwer; and is not, as ſome imagine, to decide as a Judge; his Duty is the very ſame with that of the Reſpondent: both ſtand for one and the ſame Perſon.

How to do the honours of a diſputation.

X. What form of Words a Reſpondent ſhould uſe, when giving a formal Invitation to the Opponent, and what Anſwer the

the Opponent ſhould make, on returning thanks for the honour done him, is not the buſineſs of Logic to teach, Cuſtom in thoſe caſes is the beſt Inſtructor.

Manner of diſputing by queſtions.

XI. Some are of the opinion, it were the better way to diſpute by Queſtions: But whoever will dexterouſly diſpute in that manner, muſt be firſt able to diſpute by Syllogiſm. For the whole turns on this; namely, on aſking our Opponent, whether he grants this, or the other Propoſition, or inſiſts on a farther Proof? as alſo whether he admits the Concluſion on account of the Premiſſes; that is, whether he has any thing to except either to the Matter or Form?

CHAP. XVI.

Concerning the Method of acquiring a HABIT *in the Practice of* LOGIC.

Means of obtaining the practice of logic.

I. EVERY Habit is obtained by Exerciſe or Practice. And therefore the Habit of the Practice of Logic can be no otherwiſe obtained. And as we either intermit thoſe Exerciſes, or an oppoſite Practice conſtantly prevails, we cannot arrive to that Habit, ſo highly neceſſary to every Man of Learning.

Objections.

II. But ſome will ſay, Nature exceeds Art, and conſequently natural Logic, Artificial; to a degree that ſome diſclaim all Artificial Logic, deeming the Natural ſufficient for all the purpoſes of the Underſtanding: they imagine, we can ſo juſtly uſe its Powers in the ſearch and knowledge of Truth, as to render the knowledge of the manner of uſing them unneceſſary.

Firſt anſwered.

III. In theſe objections there reigns much confuſion, producing a kind of ſpecious Semblance without any Reality. We there-

therefore need only bring this Confuſion into ſome order, and this Semblance vaniſhes, and theſe Objections fall to the ground. Man, 'tis true, has a natural aptitude or diſpoſition to produce the operations of the Underſtanding, and Rules are preſcribed to it, by which it regulates itſelf, without underſtanding them; juſt as Bodies move by certain rules or laws, and a Man, in walking, and in other Motions, obſerves a ſet of Rules, which he does not underſtand. The Rules preſcribed by God to the Underſtanding, and the natural Aptitude to act accordingly, conſtitute the natural Logic, and this laſt in particular, natural or common Senſe. Now as in other particular Diſpoſitions, by what names ſoever called, one Man excels another, juſt ſo in the Powers of the Underſtanding, one Man is more qualified for the Operations thereof than another. If therefore two Perſons, with different natural Abilities, apply to the ſtudy of Logic, and give equal diligence to acquire a Habit of the practice of it, yet one ſhall far outſtrip the other. The ſame thing, we find, holds in other caſes where a Habit is to be acquired, and therefore nothing ſtrange in the caſe of the Underſtanding. If then we would diſtinctly determine the preheminence of natural Logic to Artificial, we muſt ſay, A Perſon naturally more

qualified for the Operations of the Underſtanding than another, yet both employing an equal degree of application in the ſtudy and practice of Logic, the former will far excel the latter. Whence it follows not in the leaſt, that we muſt prefer the natural to the artificial Logic; as this laſt explains, in a diſtinct manner, the Rules of the Natural, and beſides, enables us to raiſe our natural Aptitude to a Habit.

Second anſwered.

IV. But leaſt of all can we advance, that the ſtudy and practice of Logic are unneceſſary. For when a Man has not a diſtinct knowledge of the Rules by which the Underſtanding is directed, he may err in the uſe of his natural Powers; as we have inſtances in thoſe illogical Reaſonings, by which learned Men are ſometimes led into error. The Eye alſo has its Rules, which it follows in the act of Viſion; and yet from theſe very Rules the Deception of Sight ariſes. Now whoever has a diſtinct knowledge of theſe optical Rules, can eaſily diſcover the Deception, and guard againſt any Illuſion: Juſt ſo the Underſtanding. We ſometimes imagine, that Logic is an uſeleſs acquiſition, either as we find that the Logic we were taught was of no manner of ſervice to us, or as others, who never applied themſelves thereto, have acquitted themſelves equally well with us. But the queſtion is, whether the artificial

Logic

Logic we were taught was good for any thing, as at this day a great deal is publiſhed, which on no account deſerves the name: Or though we learned the true, whether we are capable of putting it in practice; two things very different, and not always accompanying each other (§ 1.). Beſides, it is too precipitate, to hold, that Perſons who were taught no logical Syſtem, or at leaſt, who gave themſelves no concern about the Practice of it, had applied themſelves to none of its Exerciſes. As without all doubt they have, though not ſenſible of it themſelves, in as far as on all proper occaſions they imitate others, who have made due uſe of their Underſtanding.

Means of acquiring a habit in the practice of logic.

V. If we would ſet up ſuch Exerciſes as may contribute to procure a Habit in the practice of Logic, we muſt read ſuch Writings as are executed according to logical Rules, and examine them in the manner directed in Chapters IX and XI. For hereby we will not only learn better to underſtand the Rules firſt, as by our own Experience we will acquire the Notions proper to the Terms; but be alſo more and more convinced of their Juſtneſs, and ſee how they are occaſionally applied. If content barely to read over theſe Writings, without examining into the reaſon why ſuch a particular method, and not any other,

other, according to logical Rules, was uſed; we acquire, indeed, a Habit of Reflection and Reaſoning, but we arrive not at ſuch a pitch as never to be in default againſt logical Rules, and always to know how to uſe them in Caſes, where, without a diſtinct conſideration of them, we can never hope for ſucceſs.

What exerciſes ſtill wanting.

VI. A ſpecies of Exerciſe therefore ſhould be introduced, which has not hitherto been obſerved; namely, that Books ſhould be read over with Students in ſuch a manner, as to examine every Particular by, and ſhew a Reaſon thereof from, the Rules of Logic: And thus we would learn to diſtinguiſh the ſpurious from the genuine Logic; which in our day particularly is neceſſary, in which, according to the pretended freedom of Philoſophizing, ſuch Rules for Thinking are very often preſcribed, according to which, it is not poſſible for a Man to think at all; and promiſing Geniuſſes would only be ſpoilt, were they to pay any regard to ſuch directions; as they might ſucceed much better by the uſe of their natural Logic.

Mathematics, their utility.

VII. It is undeniable, that we have hitherto had no Writings, but thoſe of the ancient Geometricians, which in this reſpect can be uſed with advantage. And in order to render them ſtill more fit for this ſalutary purpoſe, I have handled the Mathematical

thematical Sciences in ſuch a manner, as that the Terms follow each other in the ſame order in which our Thoughts do, when with Underſtanding we reflect on the ſubject. This Deſign I have had conſtantly in my eye, in my German Elements of Mathematics; ſo that one, who peruſes my Writings, may not only acquire a ſolid knowledge of Mathematics in a ſhort time, but with eaſe peruſe them in ſuch a manner, as that the Underſtanding ſhall become enlarged, and prepared for the right uſe of its Powers in the knowledge and ſearch of Truth.

A prejudice removed.

VIII. Whoever perſuades himſelf, that the Mathematics give an edge to the Underſtanding, treated in whatever manner, is certainly under a miſtake. For not the Mathematical Subjects, but the Mathematical Method, and the Reflections occaſionally made thereon, are alone proper to effect this. Whoever learns Mathematics as he does other things, without obſerving a juſt method, has no great utility to expect from them in the practice of Logic; and leaſt of all, from what generally paſſes in the World for Mathematical; the Underſtanding being rather vitiated thereby, as is the caſe in the confuſed and imperfect handling of other ſubjects: and the detriment is the greater to a Perſon, from the

pre-

prejudice, that the ſtudy of Mathematics has given an edge to his Underſtanding.

How mathematics may improve the underſtanding.

IX. In order to render my German Elements of Mathematics, and the Compendium drawn therefrom, the moſt adapted that was poſſible for this purpoſe, I have propounded every thing in ſuch a method, as a Perſon by his own reflection might have eaſily diſcovered. For though I am well appriſed, that ſeveral Propoſitions in Mathematics were at firſt made out in a needleſs round-about way, and on occaſion gradually improved; yet it is certain, that if Men knew how to make the full uſe of their Underſtanding, they might have been diſcovered in the manner I propoſe. Now as we intend to learn the right uſe of our Underſtanding, and want not to run into any round-about ways or by-paths, we have there employed ſuch a method, as our preſent deſign in every reſpect requires.

Farther means.

X. We may ſee from what has been ſaid, that it depends not on Mathematical Truths to attain a Habit in the exerciſe of Logic, but on the Mathematical Method, if in every reſpect we go by the Rules of a genuine Logic. And therefore did we in other Sciences proceed in the ſame manner, we might, by a courſe of careful Reflection, attain the deſired Habit. And with this view, I have made it my buſineſs

buſineſs to handle the ſeveral branches of Philoſophy in one continued ſeries, and mutually connected method. Whoever therefore peruſes them with attention, and examines the Definitions and Demonſtrations by the logical Rules I have given, will attain to whatever he could either hope or wiſh for from Mathematical Writings.

How to combine the uſe of the ſenſes and underſtanding in the knowledge of truth.

XI. Particularly in the Eſſays towards a more accurate knowledge of Nature, or the Experimental Philoſophy, I have propounded every thing in ſuch a manner, as they might, on reflection, mutually ariſe from each other, on combining together the uſe of our Senſes and Underſtanding. And in this, my purpoſe was, how I might gradually and unnoticed bring the Reader to the practice of Reflection, in order to his obtaining a Habit of drawing determinate Propoſitions from Experience, and by means of ſome one of them, find out the ground or reaſon of the others, conſequently combine Reaſon with Experience; a thing not only of uncommon utility to thoſe who have a view to the profeſſion of the art of Healing, as in the like manner they muſt improve themſelves from Experience, and get daily more and more a firmer Footing therein; but ſerviceable alſo to all who are employed in civil affairs; in a word, to every one, who learns

moral and civil Truths from Experience; alſo to whoever would gain Prudence, with Skill to manage his private affairs among Men. And in this view, ſuch may peruſe my experimental Philoſophy with benefit, who in other reſpects trouble not their heads much about the knowledge of Nature, imagining theſe things to be mere Curioſities, which they only learn in the proſpect one day to forget: And we will ſuppoſe, that they may actually forget every Propoſition and Notion they have learned from Experimental Philoſophy, when in other circumſtances, and employed in other affairs which have no connection therewith; yet I can on no account allow, that they will loſe the Aptitude or Diſpoſition; which however, ſtill ſticks by them, to turn Experience to their own account, and thence derive a degree of Prudence, which they may retain all their days, when they are to employ it on other occaſions.

The author's latin philoſophical works, uſeful in the practice of logic.

XII. But as I have digeſted my Latin Elements of Mathematics in ſuch a method, as that they may be more commodiouſly applied to the practice of Logic; ſo my Latin Philoſophical Works are adapted to promote the ſame end to much better purpoſe than my German; as I not only give proper Definitions of every Term, particularly the Technical, and draw and demonſtrate from them and the foregoing Pro-

Propoſitions all that follow, but alſo ſeparate and diſtinguiſh them by a different Character or Type; and as I properly determine or limit every Propoſition, never intermixing with any of them whatever I add by way of Illuſtration and Obſervation, but ſubjoining it alſo in a different Type: And in particular, as I explain both Propoſitions and Definitions with ſuch Examples, as that the Reader may with eaſe and ſkill apply them in any particular Caſe. And this I have done in the Theoretical part of my Latin Logic, in order to teach at the ſame time the practice of Logic, and thereby to explain the Rules, and thus make them more intelligible. Conſequently there needs only the attentive peruſal of my Latin Philoſophical Works, to qualify the Underſtanding ſufficiently for the practice of Logic, and for gaining inſenſibly a Habit; of which there were the leſs hopes, the leſs people had formed to themſelves a Notion of any ſuch thing.

What uſe books written in the common manner are of in the practice of logic.

XIII. In Books, written in a ſuperficial manner, the Logical Rules are not only overlooked, but tranſgreſſed. And thus, Defects and Errors offer in them to remark; the former, from the neglect of Logical Rules, by omitting what ought not to be omitted; the latter, from acting againſt theſe Rules. In the practice of Logic, the knowledge of Defects and Errors is not without its Utility,

Utility, as we may thereby avoid the former, and be on our guard againſt the latter. Whatever we learn from Experience takes a firmer hold on us, and ſinks deeper into the mind, than all we diſcover by the powers of the Underſtanding, eſpecially in the caſe of our moral Actions. And thus we may peruſe Books, imperfectly written, and examine them by logical Rules, in order to find out their Defects and Errors, paſs a more accurate Judgment on them, and to be a Caution to ourſelves. And it very often happens, that by correcting the Defects and Errors of others, we at the ſame time improve ourſelves. And thus Books, in other reſpects good for nothing, procure us this benefit; namely, to render us fitter for the acquiſition of ſolid Knowledge. Beſides, that whoever is fond of ſuch Knowledge becomes more ardent in the purſuit thereof, the more ſenſible he is of the Defects and Errors ſuch are ſubject to, who take a ſuperficial ſurvey of things, and give too much place to precipitation.

This exerciſe, when to be ſet about.

XIV. Before one can well paſs a Judgment on the Defects and Errors of others, he muſt be able to perform well himſelf. For in order to paſs a Judment on Defects and Errors, we muſt be qualified to judge, whether another has been guilty of omiſſions, or has miſcarried in any other reſpect illogically (§ 13.). And therefore, in order not

not to precipitate our judgment, we muſt not only be fully maſters of the Logical Rules, but alſo know, how to apply them occaſionally: and conſequently, be previouſly capable of performing well ourſelves, before ever we preſume to paſs a judgment, in what reſpect another has miſcarried. As we therefore, firſt of all come to learn, how rightly to underſtand the Rules of Logic, with the manner of their application, after having peruſed Writings ſolidly executed, and beſides, conſidered, how they fully ſatisfy every Logical Requiſition (§ 5.); we muſt firſt peruſe with due attention, books written with ſolidity, before we venture on ſuch as are executed with leſs ſolidity; and firſt acquire a Habit of the Practice of Logic, before we preſume to judge, in what manner others have miſcarried.

Danger of precipitation.

XV. To venture firſt to examine defects and errors, while deſtitute of ſolid knowledge ourſelves, would be to endanger a miſcarriage, and make us often deem as error, what are far from being ſuch; which would the more readily happen, if altogether deſtitute of genuine Logical Rules, which can no better way be brought to the teſt, than by examining books written with ſolidity, eſpecially in imitation of the Ancients in their Geometrical Demonſtrations, to whoſe juſtneſs or rigour, nothing

can reaſonably be excepted. It is, alas! but too common to obſerve, that when people, who have learned no ſyſtem of genuine Logic, much leſs are capable of making a due application thereof, come to the peruſal of books executed with ſolidity, they imagine, they have diſcovered defects and errors in places, where the greateſt accuracy prevails. They find fault with Definitions, for the very reaſon they ought to be commended; with the order of propoſitions and their demonſtrations, for the very thing they are moſt worthy of praiſe, if ſuch perſons had attained the Habit of genuine Logic. And even others, who have laid a good foundation in Logical Knowledge, and by means of Mathematics, have attained to ſome ability therein, yet, like Novices, blunder everywhere, and deem as wrong, what as yet they underſtand not, or what had not till then offered to their mind, or what they overlooked in their noviciate exerciſes. From all which it may be abundantly ſeen, what great caution is neceſſary in examining defects and errors, committed againſt Logical Rules; eſpecially, as a great deal may have the appearance of being erroneous, which would be found juſt and right, did we know how to diſtinguiſh well the Operations of the Underſtanding from the Words in which they are ex reſſed. And

thus we muſt guard againſt all Precipitation, eſpecially in examining the Writings of thoſe, who have given proofs of their ability; ſo as not lightly to deem as faults, what we are at a loſs about underſtanding, but wait, whether, when in time come to greater ripeneſs of judgment, we may not have a different view of things. What I here write, I can ſufficiently recommend from my own experience. Beſides, there accrues other damage from the prematurely applying ourſelves to the finding out defects and errors; namely, the being puffed up with a vain conceit of ourſelves, and having in contempt, what is in itſelf really good and laudable; and thereby coming to take greater pleaſure in finding fault, than in acquiring uſeful and ſolid knowledge: on which to enlarge, is not our preſent buſineſs.

How gradually to improve in a logical habit.

XVI. But no one muſt imagine it a matter ſo eaſy, to attain to a Habit of a right uſe of Logic on all occaſions; as it requires a great deal of exerciſe, and as our improvement is but gradual and ſlow. And even at firſt, when we obſerve ſome progreſs made by us, we are apt to imagine we are got to the full completion of our wiſhes; whereas, when more advanced in the Habit, we ſhall come to ſee, that we are very far ſhort of what we fancied ourſelves in poſſeſſion of, when we had

attained but to a much leſs degree. And then at length, our eyes will be opened, and our views of things come to be quite different from what they were. I write from Experience, and whoever will go by the Advice I here impart, will find it true in every reſpect: which God grant, may be the caſe of many.

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